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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 11
JUNE 1, 1971

W71-05335 -- W71-05835

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

POLYWATER AND POLYPOLLUTANTS,
Birkbeck Coll., London (England). Dept. of Crystallography.
P. Barnes, I. Cherry, J. L. Finney, and S. Petersen.
Nature, Vol 230, No 5288, p 31-33, March 5, 1971. 3 p, 26 ref.

Descriptors: *Gels, *Water types, *Water properties, *Water chemistry, Laboratory tests, Methodology, Investigations, Pollutants, Silica, Condensation, Aqueous solutions, Water structure.
Identifiers: *Anomalous water, *Polywater.

Some careful experiments and a close look at the literature of polywater give no reason to believe that any new phenomenon has been discovered. Contamination could account for the observed effects. The degrees of anomality in the samples analyzed were determined chiefly from observations on the phase separation effects, the gel-like residue obtained after evaporation, and the shape of the density-temperature curve obtained after certain corrections had been made for the effect of the narrow capillary bore. The method of production was continually refined so as to eliminate as many sources of contamination as possible. It was concluded that the most common sources of contamination in the general production of anomalous water are as follows: (1) Gross salt contamination, by surface migration and/or vapor transport, when salt solution methods of production are used, (2) Capillary residues (nitrogenous or silicaceous) resulting from the capillary 'cleaning' process, (3) Leaching out of the intrinsic glass components (silicon and sodium) from the capillary walls, and (4) Surface migration and vapor transport of contaminants inherent in the apparatus. (Woodard-USGS)
W71-05346

DIFFUSIVITY OF OXYGEN IN AQUEOUS ELECTROLYTE SOLUTIONS,
Auburn Univ., Ala. Dept. of Chemistry.
George Wen-Chi Hung.
PhD Thesis, June 9, 1970. 142 p, 24 fig, 35 tab, 76 ref. OWRR Projects A-013-ALA (2), A-007-ALA (3), and A-018-ALA (1).

Descriptors: *Diffusivity, *Dissolved oxygen, *Electrolytes, *Aqueous solutions, Diffusion, Water chemistry, Chemical reactions, Oxidation, Ion exchange, Biochemistry, Oxygen.
Identifiers: *Oxygen diffusion.

The diffusivity of dissolved oxygen in aqueous electrolyte solutions was measured over an extended concentration range of the electrolytes. Sodium n-decylsulfonate, sodium 2, 4-dimethylbenzenesulfonate, sodium p-dodecylbenzenesulfonate, sodium chloride, sodium sulfate, and sodium phosphate were used in this investigation. The concentration range of the electrolytes extended to 2000 ppm for the three sulfonates, 2 M for the chloride, 0.9 M for the sulfate and 0.05 M for the phosphate. The diffusion coefficients of dissolved oxygen in all six systems varied with the concentration of electrolytes. The ratio of the diffusion coefficient of dissolved oxygen in electrolyte solutions to that in pure water is linear with respect to the square root of electrolyte concentrations for the chloride and phosphate solutions and for the dilute solutions of 2, 4-dimethylbenzenesulfonate and p-dodecylbenzenesulfonate; sulfate and n-decylsulfonate solutions do not demonstrate this linear behavior. The results are discussed in terms of Eyring's 'hole' theory for diffusion and viscous flow processes, and the Stokes-Einstein model for diffusivity and viscosity. (Knapp-USGS)
W71-05454

DIFFUSION COEFFICIENT OF SILICA IN SEA-WATER,
Brussels Univ. (Belgium). Industrial Chemistry Lab.; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02K.
W71-05595

MERCURY ADSORPTION OF CHROMIUM OXIDE GELS,
Brunel Univ., Uxbridge (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-05598

ANOMALOUS WATER NOT POLYWATER,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
B. A. Pethica, W. K. Thompson, and W. T. Pike.
Nature Physical Science, Vol 229, No 1, p 21-22, January 4, 1971. 2 p, 9 ref.

Descriptors: *Water types, *Water properties, *Water sources, Gels, Investigations, Methodology, Testing, Test procedures, Spectrometers, Laboratory tests, Water chemistry, Silica.
Identifiers: *Anomalous water, *Polywater, Mass spectrometer.

A number of workers have shown that there is good reason to doubt that anomalous water can be regarded as a single substance. A plausible scheme for the formation of silica sols has been outlined. The high refractive index of concentrated anomalous water reported could well be ascribed to a silicate. Supporting this view are the further results of the mass spectra examination of anomalous water. The mass spectrometric data are particularly important because of claims that anomalous water can be distilled and thus freed from involatile impurities. Repeated investigations of anomalous water on an AEI MS 902 mass spectrometer, however, with both a micro glass inlet system and direct insertion techniques under a variety of instrumental conditions (for example, low ionizing voltage, varied source temperatures) have failed to show any such ions. Considering these findings, we feel strongly that anomalous water is not polywater, and until conclusive evidence to the contrary is obtained the possibility still exists that it is a gel or solution of silicates or other materials. (Woodard-USGS)
W71-05599

MICROWAVE DIELECTRIC MEASUREMENTS ON ANOMALOUS WATER,
Cold Regions Research and Engineering Lab., Hanover, N.H. and Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
P. Hoekstra, G. Swinzow, S. Ackley, and W. T. Doyle.
Nature Physical Science, Vol 229, No 3, p 92-94, January 18, 1971. 3 p, 3 fig, 1 tab, 16 ref.

Descriptors: *Water chemistry, *Gels, *Condensation, *Water types, *Water properties, Research equipment, Methodology, Test procedures, Investigations, Laboratory tests, Electrical properties.
Identifiers: *Anomalous water, *Capillaries, Pyrex capillary tubing.

As part of a continuing investigation of the properties of water adsorbed on silicate surfaces, an analysis of the dielectric and thermochemical properties of the anomalous water substance formed in glass capillaries in such conditions was made. Capillaries were drawn from thick-walled 'Pyrex' capillary tubing (6 to 7 mm outer diameter, 3/4 to 1-1/4 mm inner diameter) by heating the glass in a flame of natural gas and oxygen. Columns of liquid were formed in approximately5% of the capillaries exposed. In most cases liquid columns did not exceed 1 to 2 mm in length; a few columns were longer than 5 mm. Often one capillary contained more than one column. A correlation was found between the dilatometric and dielectric behavior of anomalous water grown in small glass capillaries. Samples that exhibited the anomalous thermal behavior reported by other investigators showed normal dielectric behavior; samples that did not freeze when repeatedly cooled to -60 deg C had a dielectric constant and a dielectric loss less than those of normal water. (Woodard-USGS)
W71-05602

SALT EFFECTS IN AQUEOUS SOLUTIONS OF UREA,
For primary bibliographic entry see Field 02K.
W71-05618

02. WATER CYCLE

2A. General

A LABORATORY CATCHMENT AND ASSOCIATED INSTRUMENTATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
K. C. Das, and L. F. Huggins.
Paper No 70-530 presented at 1970 Annual Meeting of American Society of Agricultural Engineers, Minneapolis, Minnesota, July 7-10, 1970. 20 p, 8 fig, 1 tab, 18 ref. OWRR Project B-016-IND (1).

Descriptors: *Overland flow, *Rainfall-runoff relationships, *Hydraulic models, Model studies, Analog computers, Simulated rainfall, Hydraulic similitude, Data collections, Data processing, Instrumentation.
Identifiers: Laboratory watersheds, Watershed models.

To study in the laboratory the rainfall-runoff relationship, an experimental watershed consists of a rainfall similator, flow plane, pressure transducer to measure the depth of water on the flow plane, weighing device to measure the accumulated volume and rate of runoff, and a vertical force measuring device to determine the detention volume on the catchment. The transducer signals are sent from the laboratory to a remote analog computer where the signals are amplified and analyzed before recording on magnetic tape. Initital test results indicate that such data can be acquired with good precision and that an on-line analysis capability greatly expands the scope of feasible experiments. (Knapp-USGS)
W71-05353

ROLE OF INFILTRATION IN NONLINEAR WATERSHED ANALYSIS PROCESSES,
California Univ., Davis. Dept. of Water Science and Engineering.
J. Amorocho.
American Society of Agricultural Engineers Transactions, Vol 10, No 3, p 396-399, 404, 1967. 5 p, 7 fig, 13 ref. OWRR Project B-005-CAL (8).

Descriptors: *Infiltration, *Surface-groundwater relations, *Watersheds (Basins), *Model studies, Equations, Precipitation (Atmospheric), Vegetation, Hydrology, Hydrologic cycle, Evaporation, Soil moisture, Streamflow, Low flow, Groundwater movement, Water storage, Runoff, Sorption, Permeability.

If the ground surface of a watershed is viewed as the locus of the points of application of the net input to a hydrologic system (gross precipitation over the vegetative canopy minus interception), infiltration is then the first major branching process whereby the system becomes divided into two principal components: (1) a subsystem involving surface storage and translation elements and (2) a subsystem with groundwater storage and translation elements. Two principal types of equivalent systems have been proposed for the representation of the hydrologic cycle. One is the result of what has been termed 'hydrologic synthesis,' and the

other results from 'nonlinear functional analysis.' In synthesis, a group of components representing major watershed mechanisms are linked in such a way that they operate by cascading and branching in some logical fashion in order to convert the input into an output approximating the measured outflow of the prototype. Each one of the components has a known structure and its parameters are adjusted and optimized so that a resonable matching between predicted and recorded outflows results. With the general structure of the synthetic models of the hydrologic cycle established, questions relative to the differences between the infiltration components of the models and the prototype are examined. (Woodard-USGS)
W71-05354

REPRESENTATIVE BASINS OF NEW ZEALAND-1970.
Ministry of Works, Wellington (New Zealand). Water and Soil Div.

New Zealand Ministry of Works, Water and Soil Division Miscellaneous Hydrological Publication No 7, 1970. 291 p, 3 fig, 16 ref.

Descriptors: *Water resources, *Hydrologic data, *International Hydrological Decade, *Surface waters, Rainfall-runoff relationships, Geology, Streamflow, Topography, Vegetation, Land use, Data collections, Instrumentation, Stream gages, Soil moisture, Planning, Model studies, Maps, Watersheds (Basins).
Identifiers: *New Zealand.

This publication has been produced as part of New Zealand's contribution to the International Hydrological Decade, 1964-75. The selection of representative basins in New Zealand is based on the fundamental assumption that each individual basin is representative of its hydrological region and that the areas of the basins would be uniformly distributed between the desirable limitations of 1 and 250 square kilometers. This distribution of areas is of particular value in hydrological prediction studies, which use data from part of or the entire network. It is unlikely that any one basin is representative of all the hydrological characteristics of its region; in general it will represent the most dominant features. For instance, in the Hokianga region, where a low-flow-recession study has shown the extreme variability of the recession constants (0.47-0.95), the soil type in all catchments is the same (podzolic clays), but the lithology is variable because of the presence of volcanic outcrops. It appears that surface flows are also similar within the region. Representativeness for low flows has been tested on a large scale in Northland in the course of a water resources investigation. High-flow correlations between gaging stations in the same catchment or in adjacent catchments to establish missing stage records are presented. The text descriptions accompanying each basin map follow the pattern recommended by UNESCO. (Woodard-USGS)
W71-05448

WATER RESOURCES - APPENDIX V OF COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY,
Pacific Northwest River Basins Commission, Vancouver, Wash.
G. L. Bodhaine, H. D. Hafterson, M. J. Mundorff, and John Summersett.
April 1970. Vol 1 (Subregion 1-6), p 1-543; Vol 2 (Subregion 7-12), p 544-1022. 897 fig, 497 tab, 206 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Hydrologic data, *Pacific Northwest U.S., Water quality, Hydrology, Meteorological data, Climatology, Water rights, Water management (Applied), Water utilization, Consumptive use, Streamflow, Flow rates, Discharge measurement, Runoff, Aquifers, Water yield, Chemical analysis, Topography, Hydrographs, Water temperature, Sediment transport, Sediment yield.
Identifiers: *Water resources Index (Pacific Northwest).

This appendix, prepared under the auspices of the Pacific Northwest River Basins Commission, is one of a series of 16 making up the complete Columbia-North Pacific Region Framework Study on water and related lands. The water resources segment of the study is presented in two volumes as appendex V. Volume 1 includes subregions 1-6 (the eastern sections of the North Pacific region study), and volume 2 includes subregions 7-12 (the western sections of the region). The study consists primarily of summarization, analysis, and extension of existing data on water resources (both surface and groundwater) of the region. The base period selected is 1929-58. The discharges used throughout generally reflect 1970 or 1975 conditions of development; that is, the natural flows have been depleted and regulated for those anticipated levels of use. The quantity and quality of water available in each subregion is shown on graphs and in tables. Data on sediment and temperature also are included. Each subregion report also contains a general hydrologic description of the area; a fairly detailed description of the climate; and discussions of water use, stream management, and water rights. In addition, the Regional Summary includes sections covering technological advancements and areas of need for additional hydrologic data. (Woodard-USGS)
W71-05449

PREDICTION OF SOLAR AND ATMOSPHERIC RADIATION FOR ENERGY BUDGET STUDIES OF LAKES AND STREAMS,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 02H.
W71-05450

EFFECT OF WATERSHED CHARACTERISTICS ON THE TIME PARAMETERS OF RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
Pinhas Golany.
PhD Thesis, August 1970. 201 p, 48 fig, 38 tab, 45 ref, 2 append. OWRR Project B-007-MINN (4).

Descriptors: *Rainfall-runoff relationships, *Hydrograph analysis, *Systems analysis, *Model studies, *Streamflow, Runoff, Watersheds (Basins), Equilibrium, Runoff forecasting, Flow rates, Channel morphology, Topography, Mathematical studies, Equations, Computer programs, Mathematical models, Routing, Unsteady flow.
Identifiers: *Watershed characteristics, *Streamflow equilibrium (Time).

Physical characteristics of small watersheds in southeastern Minnesota were used to develop a mathematical model for the study of the effect of watershed characteristics on the time required for the rate of runoff at the outlet of the watershed to become equal to the supply rate. A theoretical equation is compared with an empirical equation. This is defined as 'time to virtual equilibrium'. It was concluded that the time to virtual equilibrium of a watershed is best determined as a sum of two parameters. One is the time to virtual equilibrium of the watershed, including the overland flow. The second is the channel rise time, defined as the time elapsed from time to virtual equilibrium of the elementary watershed to time to virtual equilibrium of the watershed at the outlet. The channel rise time increases with the size of the watershed. The travel time can be used to determine the channel rise time since both time parameters are functions of the same physical characteristics of the watershed, namely, the drainage area, the channel length, roughness, slope and cross section geometry. (Woodard-USGS)
W71-05452

MOUNTAIN RUNOFF AND ITS RELATION TO PRECIPITATION, GROUNDWATER, AND

RECHARGE TO THE CARBONATE AQUI OF NITTANY VALLEY, PENNSYLVANIA,
Pennsylvania State Univ., University Park. De Geology and Geophysics.
Leonard Franklin Konikow.
MS Thesis, Pennsylvania State University, Ins for Research on Land and Water Resources, M 1969. 128 p, 27 fig, 5 tab, 26 ref, 3 append. O Project A-005-PA (1).

Descriptors: *Surface-groundwater relation *Karst, *Recharge, *Pennsylvania, Carb rocks, Aquifers, Rainfall-runoff relation Hydrogeology, Hydrology, Groundwater r ment, Water balance, Hydrologic budget, In tion, Sinks.
Identifiers: Nittany Valley (Penn).

The relations between mountain runoff, prec tion, and changes in groundwater storage wer culated for the Nittany Valley of Pennsyl This required an estimate of gravity yield and surements of groundwater stage. The av gravity yield of the shale and sandstone forma beneath the ridges of Nittany and Tussey m tains was found to average about 1.5%. The g yield of the colluvium, which covers much of ridges, is about 6%. In the Pine Grove Mills the variation of gravity yield with time was ridingly controlled by its relation to mean gr water stage because of the great differen porosity between the colluvium and bed Mountain runoff from shale and sandstone was flashy, while Spring Creek in a carbonate area showed comparatively small fluctuatio discharge. Mountain streams flowing through may completely or partially sink upon crossin carbonates. (Knapp-USGS)
W71-05560

EVIDENCE FOR A DEEP WESTERN BOU RY CURRENT IN THE SOUTH IN OCEAN,
Woods Hole Oceanographic Institution, Mass.
B. A. Warren.
Supported by Office of Naval Research. N Physical Science, Vol 229, No 1, p 18-19, Ja 4, 1971. 2 p, 7 ref.

Descriptors: *Ocean currents, *Ocean circul *Indian Ocean, Boundaries (Surfaces), Mode dies, Salinity, Depth, Velocity, Density cur Flow, Currents (Water), Water circul Stratified flow.
Identifiers: *South Indian Ocean, *Oceanic dary currents.

Simple models of the deep ocean circulation southern hemisphere require narrow, north flowing currents along the western boundar the great ocean basins to transport cold, dee tarctic water into low latitudes. The deep sa maximum found throughout the southern sphere lies at depths of 2,000-3,000 m in the Indian Ocean, well above our assumed level o meridional velocity. Because the salinity max is formed through entrainment of North At deep water in the circumpolar current, such must also enter the deep Indian Ocean fro south. The way in which this comes about is n tirely clear from the present two hydrographi tions. It happens that near Madagascar, and 2,000 m, the calculated values of north geostrophic velocity generally decrease with down to about the 3,000 m level, then incr again at great depth; the assumption tha velocity is zero at 3,000 m is then consisten northward movement not only of the bottom but also of the water of maximum sa (Woodard-USGS)
W71-05596

AN EXPERIMENT IN FINITE-DIFFER WATERSHED MODELING,
Montana Univ., Boziman. Joint Water Res Research Center.
Darrel E. Dunn.

Montana University Joint Water Resources Research Center Report No 13, July 1970, 14 p, 42 ref, 36 p computer program. OWRR Project A-034-MONT (2).

Descriptors: *Model studies, *Watersheds, *Simulation analysis, *Computers, *Testing, Hydrographs, Water storage, Vadose water, Groundwater, Statistical models, Data processing, Water resources.
Identifiers: *Phreatic zone, *Watershed simulation.

This report details an attempt to develop an accurate finite-difference watershed model. The watershed was simulated by dividing the watershed system into seven cells and then calculating water transport from cell to cell through successive time increases: surface runoff, vadose zone, water table, fluctuating phreatic zone, remainder of phreatic zone, and a cell layer on the bottom and on the top for computational convenience. Cells are formed by dividing each layer by a grid into three-dimensional parallel pipeds, and then weather data are added. From this setup, any type of water storage in the system can be calculated, as well as stream hydrographs. The model was tested by attempted simulation of the Bridger Creek Watershed near Bozeman, Montana. The model failed to simulate this watershed with accuracy, and the error was so great that further testing was not attempted. A fairly large amount of computer time was used on an XDS Sigma 7 computer. It was felt that a basic deficiency of this model is lack of a cell layer to represent the upper, more permeable part of the phreatic zone. The computer program is appended to the report. (Yensen-Arizona)
W71-05701

SIMULATION VIA TIME-PARTITIONED LINEAR PROGRAMMING: A GROUND AND SURFACE WATER ALLOCATION MODEL FOR THE GALLATIN VALLEY OF MONTANA,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
Donald William Boyd.
Ph d thesis. Montana University Joint Water Resources Research Center Report No 10, June 1968. 217 p, 7 fig, 10 tab, 3 append, bibliography. OWRR Project B-029 MONT (1).

Descriptors: *Model studies, *Water shortage, *Surface-groundwater relationships, *Montana, *Economics, Irrigation, Water supply, Water demand, Irrigation water, Saturated soils, Groundwater, Water table, Computer models, Streamflow, Water users, Water utilization, Recharge, Water distribution (Applied), Data collections, Streamflow forecasting, River flow.
Identifiers: *Gallatin Valley of Montana, Gallatin River of Montana.

The Gallatin Valley, Montana, usually has water shortage only at the peak irrigation season, complicated by a rising water table caused by irrigation at the lower end of the valley. This rising water table removes land from production. The area has vast potential groundwater reserves but interbasin transfer is impracticable. The author reviews the history of the water shortage, previous studies of the problem, and the need for a model. He then details how a model was selected and derived. The model was validated against 30-year records of streamflow, with a 20 per cent error observed. The model was judged accurate enough to simulate groundwater pumping, interbasin transfer, and recharge. Economic values were then calculated, and a value sensitivity analysis made to determine economic significance. The author concludes that the model realistically simulates the key features of the Gallatin Valley water system, including historical simulation, groundwater discharge, consumptive use, and optimal allocation. Groundwater development is the obvious solution to the water shortage and rising water table. Extensive appendices give yearly streamflow, precipitation, and groundwater data. (Yensen-Arizona)
W71-05716

2B. Precipitation

A HEATED ALPINE PRECIPITATION GAUGE,
Forest and Range Experiment Station, Rangiora (New Zealand).
For primary bibliographic entry see Field 07B.
W71-05363

MONTHLY PERSISTENCE PATTERNS OF AUCKLAND RAINFALL YIELDS,
Auckland Univ. (New Zealand). Dept. of Civil Engineering.
A. J. Raudkivi, and N. Lawgun.
Journal of Hydrology (New Zealand), Vol 9, No 1, p 29-31, 1970. 3 p, 2 tab, 2 ref.

Descriptors: Correlation analysis, *Rainfall, *Distribution patterns, Stochastic processes, Markov processes, Data collections, Meteorological data, Climatology.
Identifiers: *New Zealand.

A chi-square test was used to determine the persistence pattern of the monthly rainfall data obtained from Albert Park, Auckland, New Zealand. The results indicate the months for which the rainfall yields are affected by the amounts of rain of the immediately preceding month. Only three months of the year are affected by the immediately preceding month. These are March-April, July-August, November-December. It is interesting to note that the correlated pairs of months occur at equally spaced intervals, every 4 months. Thus by the serial correlation coefficient the persistence effect is insignificant, whereas the test indicates strong persistence effects between certain pairs of months of the year. This persistence pattern could be an important factor in some hydrological studies, for example in simulation of monthly rainfall data for water resources studies. (Knapp-USGS)
W71-05364

A GENETIC APPROACH TO CLIMATIC CLASSIFICATION,
Columbia Univ., New York. Dept. of Geography.
John E. Oliver.
Annals, Association of American Geographers, Vol 60, No 4, p 615-637, December 1970. 22 fig, 2 tab, 17 ref.

Descriptors: *Air masses, *Climatic zones, *Model studies, *Classification, *Synoptic analysis, Mapping, Arid lands, Seasonal, Precipitation (Atmospheric), Temperature, Humidity, Data collections, Climatic data, Meteorological data.
Identifiers: *Climatic classification, *Thermohyets, *Australia.

Because climatic systems have largely been approached as summations of annual temperature and precipitation values, a close, dynamic relationship between climate and related physical systems has never been clearly established. Once identified, an air mass can be interpreted in terms of temperature, humidity, stability characteristics and probable precipitation yield. A genetic approach to climatic classification was therefore devised using an air mass model whose transitional character is necessarily aligned to the transitional distribution of other natural systems, such as vegetative, pedogenic and geomorphic regimes. Set-theoretic diagrams were devised, representing 5 basic air mass designations, polar, tropical, equatorial, maritime and continental. Three basic climatic regimes are distinguished: (1) dominant, in which a single air mass dominates all year, (2) seasonal, in which 2 air masses are seasonally dominant (3) compound, which are influenced by more than 2 air masses during the year or in which no dominant air mass is distinguishable. A 3-directional matrix showing variations between dominant regimes suggests that compound regimes are transitions from one seasonal regime to another. A table is presented showing the determination of differing climates within regimes by air mass types. Air masses are differentiated on the basis of mean surface temperatures and specific humidity values. Monthly air mass dominance is determined by analysis of surface station data. Constructions of modified climographs, thermohygric diagrams and monthly air mass identification charts (MAMI) are described. Data from 90 Australian weather stations were used to test air mass differention using MAMI charts. Seasonally dominant air masses and their migrations were clearly shown. (Casey-Arizona)
W71-05476

THE NORTH AFRICAN FLOOD DISASTER, SEPTEMBER 1969,
Anti-Locust Research Centre, London (England).
D. Winstanley.
Weather, Vol 25, No 9, p 390-403, September 1970. 7 fig, 1 tab, 13 ref.

Descriptors: *Cyclones, *Precipitation (Atmospheric), *Fronts (Atmospheric), *Winds, Historic flood, Flood damage, Rainfall, Weather patterns, Weather data, Climatic data, Storm structure, Air circulation, Air masses, Air temperature, Boundary processes, Precipitation excess, Depression storage, Mountains, Impact (Rainfall), Synoptic analysis, Marine air masses, Floods, Thermocline, Atmosphere.
Identifiers: *North Africa, *Cyclogenesis, Desert Locusts, Mediterranean.

On 23 September, 1969, a cyclonic storm developed over the central Mediterranean, which moved westward over the next few days, across northwestern Libya and southern Tunisia, before finally dissipating over northeastern Tunisia. The resulting tolls in property and human lives were unprecedented. The accompanying rains even facilitated an unprecedented Desert Locust population explosion through the following winter and spring. Data from a great number of weather stations in the Mediterranean area were collected and analyzed for the factors involved in the genesis of the cyclone. The September monthly rainfall total at Biskra, Algeria, was 299.2 mm, compared to a previous record of 124.0 mm. A sequence of 1200 GMT surface charts indicate the main surface feature was the development of a Saharan depression over northern Algeria, which resulted from the anchoring of a lee depression by the Atlas mountains moving slowly northeastward until it was forced south by cool air. The Saharan depression finally moved out over the Mediterranean while other surface conditions which contribute to cyclone formation, were developing. Over northern Algeria and Morocco, the usual large temperature difference between the Mediterranean coast and the desert was enhanced by the orographic barrier. In addition to surface effects, and differential heating, flow is analyzed at different trophospheric levels, and cyclonic conditions are analyzed in terms of large-scale atmospheric flow patterns within which more local changes are taking place. (Casey-Arizona)
W71-05484

CATCHMENT EVAPORATION AND POTENTIAL EVAPORATION-FURTHER DEVELOPMENT OF A CLIMATOLOGIC RELATIONSHIP,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02D.
W71-05588

CONVERGENCE ZONES IN SOUTHER CALIFORNIA,
Weather Bureau, Los Angeles, Calif.
J. H. Aldrich.
Weather, Vol 25, No 4, p 140-146, April 1970. 3 fig, 5 ref.

Descriptors: *Winds, *Climatic zones, *Sea breezes, *Air masses, *Fronts (Atmospheric), Air circulation, Air temperature, Atmosphere, Boundary processes, Air-water interfaces, Air environment, Environmental effects, Mode of action,

California, Arid lands, Climatology, Clouds, Humidity, Weather patterns, Wind pressure, Shear, Air pollution, Temperature, Precipitation (Atmospheric), Arizona, Wind velocity.
Identifiers: *Convergence zones, *Shear lines, *Wind shear, *Temperature inversions.

The lifting forces of the atmosphere which create soaring conditions for birds and gliders are created by forcing excess air upward. A shear line is a line or narrow zone across which there is an abrupt change in the horizontal wind velocity parallel to this line. Convergence involves an accumulation of air mass leading to vertical motion which limits the amount of excess air. A convergence line is a horizontal non-frontral line along which horizontal air has a maximum convergence. The best known form of shear line is that formed by a sea breeze. Solar heating and rising warm air over land create a convergent flow at the cooler sea breeze front, which usually produces lift and a shear line between the sea air and the land air. Passing storms, low-level temperature inversions and high mountains may all complicate this phenomenon. In Southern California a temperature inversion above the cool sea air and varied patterns of coastal hills and high mountain ranges produce very complex results. Some sea air does rise several thousand feet to flow through mountain passes into the desert. The San Fernando Convergence Zone, the Elsinore shear line, the El Mirage Shear over the Mojave Desert and the Tehachapi shear are all situations produced by factors complicating sea and mountain breezes. Another type of convergence zone occurs over the southwest U.S. when moisture-laden southeastern currents converge over Arizona with a drier flow from Southern California, creating abundant cumulus clouds and thunderstorms over the lower Colorado River Valley. (Casey-Arizona)
W71-05710

2C. Snow, Ice, and Frost

GLACIAL GEOLOGY OF THE CHAMPLAIN VALLEY: 1966-1970,
Vermont Univ., Burlington. Dept. of Geology.
W. Philip Wagner.
Available from NTIS as PB-197 882, $3.00 in paper copy, $0.95 in microfiche. Vermont University Water Resources Research Center Completion Report, February 1971. 11 p, 3 fig, 9 ref. OWRR Project A-006-VT (2).

Descriptors: *Hydrogeology, *Glacial drift, *Vermont, Lakes, Alluvium, Deltas, Sands, Gravels, Aquifers, Water yield, Geology, Water resources development, Paleohydrology, Sediments, Geohydrologic units.
Identifiers: *Lake Champlain, *Champlain Valley (Vt).

Detailed study of the distribution of surficial materials in the Champlain Valley, Vermont, established a framework for the glacial history and provided basic information relevant to water supply, waste disposal, and sand and gravel resources. Postglacial modifications of the glaciated landscape include stream incision of up to several hundred feet, deposition of stream alluvium, and progressive submergence of southern portions of the Lake Champlain basin due to isostatic uplift of the spillway to the St. Lawrence River. High yield water supplies from surficial materials is limited to alluvium but quantities sufficient for domestic supplies are available in most places. Septic systems and sanitary landfills are probably most favorably accommodated by delta sands and gravels. Sand and gravel supplies are provided by ice marginal deposits and upland deltas. (Knapp-USGS)
W71-05337

SNOW SURVEY TECHNIQUES IN THE WAITAKI CATCHMENT, SOUTH CANTERBURY,
Ministry of Works, Timaru (New Zealand).
T. J. H. Chinn.
Journal of Hydrology (New Zealand), Vol 8, No 2, p 68-76, 1969. 9 p, 3 fig, 6 ref.

Descriptors: *Snow surveys, *Sampling, *Runoff forecasting, Glaciers, Snowpacks, Snow management, Precipitation gages, Water yield.
Identifiers: *New Zealand.

A brief outline is given of observations being made on seasonal snow at snow courses in the Waitaki catchment and the Tasman Glacier, New Zealand. Sampling difficulties are often caused by ice lmelting of ice layers also creates difficulties in interpreting summer samples. To overcome this problem without digging pits, a circular shaft, constructed of corrugated iron, was installed on the Tasman Glacier. This enables snow layers to be marked and sampled at any depth within the shaft. Loss of records has often occurred because sampling-site marker poles have been overtopped or broken by strong winds; poles consisting of lengths of PVC piping supported by one guy wire have been found partially successful in preventing this. (Knapp-USGS)
W71-05355

STUDIES OF SNOW CHARACTERISTICS IN THE NORTH-EASTERN BEN OHAU MOUNTAINS, NEW ZEALAND,
Department of Scientific and Industrial Research, Lincoln (New Zealand). Grasslands Div.
A. C. Archer.
Journal of Hydrology (New Zealand), Vol 9, No 1, p 4-21, 1970. 18 p, 9 fig, 6 tab, 13 ref.

Descriptors: *Snowpacks, *Snow surveys, *Water yield, *Snowmelt, Regression analysis, Runoff forecasting, Ablation, Temperature, Regimen, Weather, Meteorology.
Identifiers: *New Zealand).

Seasonal snow characteristics were studied during the winter and spring of 1966 and 1967 in the subalpine and alpine zones of the northeastern Ben Ohau Range, New Zealand. Five snow courses were established at altitudes of 3,200 ft, 4,100 ft, 5,000 ft, and 5,400 ft. Snow depths, snow density and water equivalents were measured along each snow course. A positive linear regression was established of increasing water equivalents with altitude. Temperatures were also recorded 16 in. above ground surface at 3,200 ft, 4,100 ft, and 5,000 ft, and an index of snow melt was compiled at 5,000 ft from screen temperatures and ablation rates. Characteristic slow net accumulation and rapid ablation are discussed in relation to weather phenomena. (Knapp-USGS)
W71-05362

A HEATED ALPINE PRECIPITATION GAUGE,
Forest and Range Experiment Station, Rangiora (New Zealand).
For primary bibliographic entry see Field 07B.
W71-05363

ESTIMATE OF GLACIERS SECULAR (1948-1966) VOLUMETRIC CHANGE AND ITS CONTRIBUTION TO THE DISCHARGE IN THE UPPER NORTH SASKATCHEWAN RIVER BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
W. E. S. Henoch.
Journal of Hydrology, Vol 12, No 2, p 145-160, January 1971. 16 p, 7 fig, 3 tab, 27 ref.

Descriptors: *Glaciers, *Ablation, *Regimen, *Water yield, Discharge (Water), Surveys, Data collections, Hydrologic data, Melting, Water storage, Climatology, Climatic data.
Identifiers: *North Saskatchewan River (Canada), *Glacier recession (Canada).

The recent trend of glacier recession in the Rocky Mountains began in the late 19th century. Since that time numerous studies of glaciers have been made but estimates of glacier volume decrease and the resultant increase in river discharge are lacking. Quantitative measurements show that glacier volume loss in the Upper North Saskatchewan River Basin during the period 1948-1966 was 1 cu km. This is approximately 4% of the total discharge determined from the records of the hydrometric stations at Saskatchewan Crossing and Mistaya River. (Knapp-USGS)
W71-05593

RHEOLOGICAL PROPERTIES AND BEARING CAPACITY OF FROZEN SOILS,
S. S. Vyalov.
Trans from Russian. Available from NTIS as AD-481 856, $3.00 in paper copy, $0.95 in microfiche. Cold Regions Research and Engineering Lab., Hanover, NH. Translation 74, Sept 1965. 219 p.
Identifiers: *Soil mechanics, Physical properties, *Soils, Cold weather tests, USSR, Loading (Mechanics), Deformation, Compressive properties, Plasticity, Failure (Mechanics), Fracture (Mechanics), Penetration, Buckling (Mechanics), Sand, Silt, Ice, Melting, Shear stresses, Water, Mud, Foundations (Structures), Permafrost, Stability, Arctic regions, Translations.

The rheological properties of frozen soil caused by the presence of ice and non-frozen water are important factors, without consideration of which calculations of the stability and steadiness of frozen soil are not possible. In the present work certain principles of rheology and the stability of frozen soil were examined, and proceeding from these principles an evaluation of the bearing capacity of natural footings and artificial pile foundations was made.
W71-05671

2D. Evaporation and Transpiration

PREDICTION OF SOLAR AND ATMOSPHERIC RADIATION FOR ENERGY BUDGET STUDIES OF LAKES AND STREAMS,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 02H.
W71-05450

THE EFFECT OF ANTITRANSPIRANT MATERIALS ON THE RADIATION BALANCE AND EVAPORTANSPIRATION IN AN IRRIGATED ALFALFA FIELD, ADDENDUM TO FINAL REPORT,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
Thomas A. Hales.
Horticulture Progress Report 83, December 1970. 180 p, 42 fig, 33 tab, 61 ref, 3 append. OWRR Project A-001-NEB (9).

Descriptors: *Evapotranspiration control, *Nebraska, *Alfalfa, *Chemcontrol, Water conservation, Water balance, Solar radiation, Irrigation, Water utilization, Consumptive use.
Identifiers: Atrazine, Antitranspirants.

A series of tests was carried out to test antitranspirants on 'Ranger' alfalfa in the Great Plains. Phenylmercuric acetate (PMA), Atrazine and Vatsol OT reduced transpiration but caused some foliar damage. Span 80 and Geon 652 reduced transpiration with no undesirable effects on plant growth. Replicated 3 m square plots were used to test various concentrations of PMA, Atrazine, Span 80 and Antifoamer A for effects on stomatal aperture, reflected solar radiation, net radiation, foliar production and soil moisture depletion. The PMA solutions increased leaf resistance as measured with a diffusion porometer. Neither PMA nor Antifoamer A affected net radiation, evapotranspiration, sensible heat flux or leaf temperature. Micrometeorological techniques used to measure the effectiveness of antitranspirant materials indicated no reduction in the evapotranspiration by field grown alfalfa at Mead, Nebraska. These experiments do not suggest any practical advantage to the use of antitranspirants on alfalfa in the central Great Plains. (Knapp-USGS)

W71-05453

POTENTIAL EVAPORATION: THE COMBINATION CONCEPT AND ITS EXPERIMENTAL VERIFICATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
C. H. M. Van Bavel.
Water Resources Research, Vol 2, No 3, p 455-467, 1966. 13 p, 6 fig, 5 tab, 21 ref, append.

Descriptors: *Evaporation, *Evapotranspiration, *Model studies, *Arizona, Surface waters, Hydrologic data, Soils, Alfalfa, Meteorology, Mathematical studies, Equations, Surface tension, Water vapor, Heat transfer, Radiation, Temperature, Topography, Vapor pressure, Latent heat, Weather patterns, Forecasting, Testing, Evaluation, Climatology, Winds, Wind velocity, Elevation.
Identifiers: *Potential evaporation rate.

Using a combination of a surface energy balance equation and an approximate expression of water vapor and sensible heat transfer, an equation is formulated relating potential evaporation for net radiation, ambient air properties, and surface roughness. The proposed model contains no empirical constants or functions. Tests of the model in Phoenix, Arizona, using open water, wet bare soil, and well watered alfalfa, show excellent agreement of calculated and measured values on an hourly and daily basis under a variety of circumstances. Test conditions typically included advection of sensible heat to the evaporating surface in a large proportion to the latent heat flux, as well as high values of radiant flux, ambient temperatures, and vapor pressure deficits. The use of daily average values for the weather variables in the model, rather than hourly data, did not give appreciably different results or conclusions on a series of mostly clear days, suggesting that the combination model is not only accurate but also practical and generally applicable. (Woodard-USGS)
W71-05587

CATCHMENT EVAPORATION AND POTENTIAL EVAPORATION-FURTHER DEVELOPMENT OF A CLIMATOLOGIC RELATIONSHIP,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
F. I. Morton.
Journal of Hydrology, Vol 12, No 2, p 81-99, January 1971. 19 p, 4 fig, 1 tab, 15 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Mathematical models, Climatology, Climatic data, Meteorological data, Model studies, Weather data, Energy budget, Water balance, Solar radiation, Snowpacks.
Identifiers: *Canada, *Ireland, *Potential evaporation.

When evaporation from the surfaces of a region is limited by the availability of moisture, the resultant changes in the temperature and humidity of the overpassing air are reflected in the potential evaporation. Such interactions have provided the basis for the development of a model in which the regional evaporation, a product of climatic, soil moisture and vegetative processes, is estimated from its effects on potential evaporation or on representative climatological observations. The results are tested with previously published hydrologic and climatologic data from 20 river catchments in Canada and Ireland. These catchments have a range in annual runoff of approximately zero to one meter and a range of snow cover duration from almost zero to six months. Comparison of model predictions with precipitation less runoff estimates for five-year periods provides reasonable evidence for the validity of the model with a maximum deviation of 44 mm per yr, or 9%, and a standard error of estimate of 26 mm per yr. Seasonal comparisons show the variability of catchment storage and the effects of climate and topography on regional evaporation. (Knapp-USGS)

W71-05588

AVAILABLE WATER AS RELATED TO EVAPOTRANSPIRATION RATES AND DEEP DRAINAGE,
Agricultural Research Service, Prosser, Wash.
For primary bibliographic entry see Field 02G.
W71-05606

NET AND SOLAR RADIATION RELATIONS OVER IRRIGATED FIELD CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
Leo J. Fritschen.
Agricultural Meteorology, Vol 4, p 55-62, 1967. 8 p, 1 tab, 12 ref.

Descriptors: *Evapotranspiration, *Solar radiation, *Soil moisture, *Irrigated land, *Field crops, Data collections, Statistical methods, Regression analysis, Equations, Albedo, Radiation, Alfalfa, Barley, Cotton, Oats, Wheat, Sorghum.
Identifiers: Standard errors.

A relation was sought between solar radiation and net radiation measured over irrigated field crops of alfalfa, barley, wheat, oats, cotton, and sorghum for estimating evapotranspiration from crop surfaces. Data collected under field conditions were analyzed by linear regression techniques. Standard deviation from regression was 0.02 ly/min for individual days and for individual crops. The regression equations changed from day to day; therefore, were of little value for estimation purposes. Seasonal data for individual crops were pooled and analyzed by linear regression. The resulting standard errors were about twice as large as those for individual days, ranging from 0.02 to 0.05 ly/min. When the data for all crops and all days were pooled and analyzed by linear regression, the resulting standard error was 0.06 ly/min. Thus, estimating net radiation for any of the crops from solar radiation would result in a standard error of 38 ly, or approximately 10%, for a 12-hour day having 649 ly incoming radiation. The regression equation may be solved using either hourly or daily solar radiation data. In the absence of net radiation data either the pooled regression or the individual crop regressions may provide sufficiently accurate estimates for some applications-for example, estimating evapotranspiration to be used in the design of irrigation projects. (Woodard-USGS)
W71-05622

WATER BALANCE IN LEAF TISSUE,
Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
Jana Pospisilova.
Biologia Plantarum (Praha), Vol 11, No 2, p 119-129, 1969. 13 fig, 10 ref.

Descriptors: *Leaves, *Water balance, *Transpiration, *Absorption, *Water transfer, Plant physiology, Stomata, Laboratory tests, Humidity, Temperature, Gravimetry, Evaporation, Saturation, Time lag, Moisture stress, Plant tissues.
Identifiers: *Water potential, *Water saturation deficit.

The relative rates of water absorption and transpiration determine water balance in leaf tissue. A technique was developed for determining simultaneous water absorption and transpiration at various initial water saturation deficits (wsd) when these phenomena are occurring simultaneously in different parts of a leaf. A plexiglass chamber was built with 3 equal-sized compartments. A segment of leaf tissue could be separated by the compartments so that water could be absorbed on 1 side, transported through the middle compartment and transpirated on the other side. Leaves were subjected to 4 types of external conditions in which relative humidity and linear rate of airflow differed, creating varying water potential gradients between leaf and surrounding air. Water absorption, transpiration intensity and wsd were continuously monitored by gravimetric methods. Results indicated that high wsd are found in leaf tissue supplied with sufficient water from 1 side, even under conditions where evaporation and transpiration intensities were not extremely high. Comparing upper, middle and lower leaves and leaves from younger and older plants, it was found that upper leaves and leaves from younger plants showed the lowest water absorption/transpiration intensity ratios. Also, water transport was practically independent of vessel orientation in leaf tissue samples. Vessel incisisions resulted in considerable changes in water balance. (Casey-Arizona)
W71-05709

A STUDY OF THE MECHANISMS AND SUPPRESSION OF EVAPORATION OF WATER FROM SOILS,
Texas A and M Univ., College Station. Water Resources Inst.
C. W. Wendt.
Available from NTIS as PB-197 999, $3.00 in paper copy, $0.95 in microfiche. Texas Water Resources Institute, Texas A and M University, Technical Report 33, Feb 1971. 123 p, 25 tab, 38 fig, 13 ref. OWRR Project B-002-TEX (6).

Descriptors: *Evaporation, *Evaporation control, *Evapotranspiration, *Soil moisture, *Water conservation, Consumptive use, Irrigation.

Extensive greenhouse experiments were conducted to evaluate chemicals not previously studied extensively for their potential as evaporation suppressants. Included in the studies were crude oil, anionics, cationics, nonionics, silicones, polysaccharide-gum mixtures, oil-latex mixtures, fatty alcohols, and reflectance materials. Of these compounds, only crude oil and crude oil-cationic mixtures were effective in suppressing soil water evaporation significantly when applied to smooth Olton loam wet soil surfaces. This cationics apparently acted as a bond between the cation exchange capacity of the soil. In some cases the crude oil affected emergency of tomatoes and onions, but did not effect the emergence of cucumbers. The crude oil was most effective on smooth wet soil surfaces and least effective on rough dry surfaces. Crude oil-treated surfaces were effective against wind speeds up to 6.5 m/sec (15mph) for 3-4 days at rates as low as 946 l/ha (100 gal/acre). As soil temperature was increased from 10 deg C. to 38 deg C. crude oil-treated surfaces were less effective in suppressing evaporation due to the increased vapor pressure of the soil water. Varying the light intensity from 0.15 to 0.60 Langleys/min did not influence the evaporation from crude oil surfaces in the controlled environment chamber. Crude oil appears to be an effective evaporation suppressant when applied to a smooth wet soil surface. Further, it is most effective immediately after water applications when the soil water evaporation rate is the highest, and the most economical material reported to date ($3 - $18 per acre or $.06 a gallon).
W71-05717

2E. Streamflow and Runoff

A LABORATORY CATCHMENT AND ASSOCIATED INSTRUMENTATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02A.
W71-05353

A PROPOSED STREAMFLOW DATA PROGRAM FOR CENTRAL NEW ENGLAND,
Geological Survey, Boston, Mass.
Carl G. Johnson.
Geological Survey Open-file report, 1970. 38 p, 3 fig, 7 tab, 8 ref, append.

Descriptors: *Streamflow, *Hydrologic data, *Project planning, *New England, Evaluation, Data collections, Gaging stations, Time series analysis,

Water resources development, River basins, Watershed management, Flow characteristics, Channel morphology, Precipitation (Atmospheric), Topography, Regression analysis, Soils, Vegetation, Stream gages, Surface waters, Lakes, Elevation.
Identifiers: *Streamflow data evaluation (Central New England).

An evaluation of the streamflow data available in Central New England was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. A summary table includes all streamflow stations now in operation and those to be established for the proposed program. Each station is identified as to type of data and recommendations are made as to whether the station should be included in the proposed network or whether it has met its objective and could be discontinued. Data collected at most current-purpose gaging stations may also be used for planning and design. (Woodard-USGS)
W71-05360

STREAM DISCHARGE ESTIMATION,
Forest and Range Experiment Station, Rangiora (Newland).
For primary bibliographic entry see Field 07B.
W71-05361

A PROPOSED STREAMFLOW DATA PROGRAM FOR MISSOURI,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 07A.
W71-05369

AN OPTIMUM WATER ALLOCATION MODEL BASED ON AN ANALYSIS FOR THE KISSIMMEE RIVER BASIN (PHASE I)-PROGRESS REPORT.
Florida Univ., Gainesville. Dept. of Agricultural Economics; and Central and Southern Florida Flood Control District, West Palm Beach.

Florida University Water Resources Research Center Report, December 1970. 27 p, 3 fig, 11 tab. OWRR Project B-005-FLA (2).

Descriptors: *Water resources development, *Model studies, *Florida, *Surface waters, *Water allocation (Policy), Irrigation, Percolation, Agriculture, Mathematical studies, Equations, Computer programs, Hydrologic data, Hydrologic cycle, Lakes, Streams, Reservoirs, Storage, Evaporation, Water utilization, Consumptive use, Test procedures, Methodology, Evaluation, Water demand.
Identifiers: *Kissimmee River basin (Fla).

This research, concerning the optimum allocation of water in Central and Southern Florida, uses the Kissimmee River Basin as a pilot study area. A dynamic linear programming model was developed to allocate the water among the alternative uses within the upper sub-watershed and between time periods within that sub-watershed. The year was divided into four time periods for the purpose of data collection and developing the programming model. The determination of the time periods was based on the amount of precipitation and the demand for supplemental irrigation. The four time periods were: (1) June, July, August and September; (2) October and November; (3) December and January; and (4) February, March, April and May. Data were collected for each time period to estimate the benefits (such as, agricultural and recreational) froof water; the quantity of water available for allocation (such as rainfall, runoff and evaporation); the restrictions on the use of water; and stage-storage damage relationships. These data were then applied to the dynamic linear programming model to determine the optimum allocation of water under present conditions. The programming model proved useful for determining the optimum allocation of water among different time periods within the sub-watershed. (Woodard-USGS)
W71-05370

A PROPOSED STREAMFLOW-DATA PROGRAM FOR IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 07A.
W71-05373

SURFACE WATER DATA - QUEBEC, WATER YEAR 1966.
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07C.
W71-05375

FLOOD FREQUENCY IN ALASKA,
Geological Survey, Anchorage, Alaska.
Joseph M. Childers.
Geological Survey Alaska District Open-file report, 1970. 30 p, 3 fig, 3 tab, 5 ref, append.

Descriptors: *Floods, *Flood forecasting, *Alaska, *Hydrologic data, *Data collections, Streamflow, Gaging stations, Flow rates, Precipitation (Atmospheric), Geomorphology, Regional flood, Frequency, Flood plains, Hydrology, Maximum probable flood, Peak discharge, Runoff, Discharge measurement, Statistical methods.
Identifiers: Standard project flood, Intermediate regional flood.

Records of peak discharge at 183 sites were used to study flood frequency in Alaska. Peak stream discharges, where gaging-station records were available, were analyzed for 2, 5, 10, 25, and 50-year average-recurrence intervals. A regional analysis of the flood characteristics by multiple-regression methods gave a set of equations that can be used to estimate floods of selected recurrence intervals up to 50 years for any site on any stream in Alaska. The equations relate floods to drainage-basin characteristics. In Alaska the 50-year flood can be estimated from 10-year gaging station records with a standard error of 22 percent whereas the 50-year flood can be estimated from the regression equation with a standard error of 53 percent. Also, maximum known floods at more than 500 gaging stations and miscellaneous sites in Alaska were related to drainage-area size. An envelope curve of 500 cubic feet per second per square mile covered all but 2 floods in the State. (Woodard-USGS)
W71-05378

A PROPOSED STREAMFLOW DATA PROGRAM FOR MISSISSIPPI,
Geological Survey, Jackson, Miss.
James D. Shell, and Fred H. Thomson.
Geological Survey Open-file Report, 1970. 48 p, 5 fig, 10 tab.

Descriptors: *Streamflow, *Hydrologic data, *Project planning, *Mississippi, Data collections, Gaging stations, Evaluation, Time series analysis, River basins, Network design, Data processing, Regression analysis, Watershed management.
Identifiers: Current purpose data.

An evaluation is made of available streamflow data in Mississippi to provide guidelines for planning future hydrologic data collection programs. The evaluation is in three basic steps; definition of the long-term goals of the streamflow data program in quantitative form, examination and analysis of available data to determine goals achieved, and development of proposals of ways to meet the remaining goals. General objective of the data collection program is to be able to furnish necessary estimates of streamflow characteristics for any site on any stream in the State, with specific accuracy goals. It was found that several of these goals could be met by generalization of the data from gaged basins by regression analysis. This allows significant changes to be made in the present collection system that will permit emphasis to be placed on attaining unmet goals. A network design is presented for implementing the proposed streamflow data program to meet future needs. (Lang-USGS)
W71-05445

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 10. THE GREAT BASIN.
Geological Survey, Washington, D.C.

For sale by the Superintendent of Documents, US Government Printing Office, Wash, DC 20402 : Price $4.50 (paper cover). Geological Survey Water-Supply Paper 1927, 1970. 978 p, 1 fig, 1 plate.

Descriptors: *Streamflow, *Hydrologic data, *Flow measurement, *Great Basin, *Gaging stations, Data collections, Flow rates, Average flow, Surface waters, Low flow, Peak discharge, Stream gages, Reservoir stages, Lakes, Discharge measurement.
Identifiers: *Streamflow basic data, Western United States.

Records of stage, discharge, and content of streams, lakes, and reservoirs in the Great Basin of the western United States are presented for the period October 1, 1960 to September 30, 1965. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs the data comprise a description of the station and a monthly summary table of stage and contents. Data for partial-record stations include discharge measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W71-05446

WATER RESOURCES - APPENDIX V OF COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY,
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 02A.
W71-05449

BIG BLUE RIVER BASIN APPENDIX.
Nebraska Soil and Water Conservation Commission, Lincoln.

Nebraska Soil and Water Conservation Commission State Water Plan Publication No 201A, September 1968. 144 p, 3 fig, 35 tab, 6 ref, 7 plate.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Nebraska, Irrigation water, Recreation, Flood control, Erosion control, Reservoirs, Planning, Hydrogeology, Hydrology, Geology, Hydrologic data, Water quality, Water utilization.
Identifiers: *Big Blue River Basin (Nebraska).

This appendix presents information and data concerning water resources development in the Big Blue River Basin in Nebraska under six sections as follows: Flood Control; Water Quality; Irrigation Water Management; Fish and Wildlife; Geology and Groundwater; and Water Utilization. Floods have occurred in 35 of the 64 years of record (1902-1965). Current efforts involve analysis of the flood problems. Suspended sediment is the most important pollutant in the Big Blue River. Crop irrigation is a consumptive and a necessary use of water in Nebraska. The supply of outdoor

recreation resources is critically short. Public areas designated for outdoor recreation include only 0.14 percent of the total land area. Groundwater storage reservoirs are quite extensive in the upper and central parts of the basin. The groundwater table is currently declining in localized areas of high concentration of irrigation wells. The water used for municipal and industrial purposes is at present being supplied entirely from groundwater sources. Plans for water resources development and control are discussed. (See also W70-04603) (Woodard-USGS)
W71-05451

EFFECT OF WATERSHED CHARACTERISTICS ON THE TIME PARAMETERS OF RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02A.
W71-05452

SOLUTION OF A BOUNDARY VALUE PROBLEM OF NONSTEADY SMOOTHLY VARYING FLOW OF A LIQUID BY THE IMPLICIT FINITE-DIFFERENCE METHOD,
For primary bibliographic entry see Field 08B.
W71-05457

FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND,
Battelle Memorial Inst., Columbus, Ohio.
John M. Neubold, and William T. Helm.
Available from NTIS as BMI 171 127, $3.00 in paper copy, $0.95 in microfiche. Annual Progress Report on the Amchitka Bioenvironmental Program, April 1970. 48 p, 6 fig, 32 tab. AEC AT (26-1)-171.
Identifiers: *Streams, *Ecology, *Fresh water biology, Streams, *Islands, Landforms, Ecology, Aquatic animals, Biomass, *Amchitka Island.

Estimates are given for stream primary production, detritus and dissolved organic content (carbon content), invertebrate populations, and fish populations. Salmon spawning on the Island is regarded as minimal in terms of contributing to the commercial salmon fishery. Most liberal estimates of silver salmon production on the Island amounted to only 1,600 smolts. Similarly, the streams on the Island were estimated to produce approximately 8,000 pink salmon fry to the marine environment. Some evidence existed for intertidal spawning by pink salmon, but no estimate could be hazarded here. Essentially, the data collected during the year corroborated the data collected during fiscal year 1968, that is, that the food-energy economics base of the lakes and streams under investigation are primarily detritus based, judging from the food ingested by the Dolly Varden and the threespine stickleback. Some variation, however, was experienced in the quality of food ingested by both the Dolly Varden and threespine stickleback. This quality varied with the season. During the summer portions of the year, some herbivorous insects were found in significant quantities in the fishes' guts. These included caddisflies and mayflies. In addition, the Dolly Varden did take threespine stickleback in the wintertime. The data collected, when converted to biomass production, yielded models that gave confidence that estimates of energy flow would be reliable.
W71-05461

THE NORTH AFRICAN FLOOD DISASTER, SEPTEMBER 1969,
Anti-Locust Research Centre, London (England).
For primary bibliographic entry see Field 02B.
W71-05484

FLOODS ON NAPA RIVER AT NAPA, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-05559

MOUNTAIN RUNOFF AND ITS RELATION TO PRECIPITATION, GROUNDWATER, AND RECHARGE TO THE CARBONATE AQUIFERS OF NITTANY VALLEY, PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02A.
W71-05560

EXTENDING THE RECORD ON THE TEME,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-05589

SEASONAL FLOOD BEHAVIOR IN A CLAY CATCHMENT,
Liverpool Univ. (England). Dept. of Geography.
A. M. Harvey.
Journal of Hydrology, Vol 12, No 2, p 129-144, January 1971. 16 p, 9 fig, 4 tab, 14 ref.

Descriptors: *Hydrograph analysis, *Unit hydrographs, *Floods, *Flood forecasting, *Rainfall-runoff relationships, Rainfall, Runoff forecasting, Infiltration, Soil moisture, Surface runoff, Duration curves, Depth-area-duration analysis, Clays, Permeability.
Identifiers: River Ter (England).

The unit hydrograph method is applied to the analysis of the flood hydrology of the River Ter, a stream draining a clay catchment in Eastern England. Two distinct types of simple flood hydrograph resulting from storm rainfall are identified, one characteristic of winter runoff, and a shorter duration type occurring only during the summer. Most of the major floods result from longer and more complex rain periods producing flood hydrographs which may be interpreted as coalescent or superimposed hydrographs of one of the two simple types. The seasonal variation in simple hydrograph form is interpreted as the result of runoff normally occurring from only part of the catchment during the summer months. This is probably due to areal variations in the nature of seasonal changes in soil moisture conditions and crop cover. (Knapp-USGS)
W71-05592

ESTIMATE OF GLACIERS SECULAR (1948-1966) VOLUMETRIC CHANGE AND ITS CONTRIBUTION TO THE DISCHARGE IN THE UPPER NORTH SASKATCHEWAN RIVER BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02C.
W71-05593

EVIDENCE FOR A DEEP WESTERN BOUNDARY CURRENT IN THE SOUTH INDIAN OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02A.
W71-05596

A COMPARATIVE STUDY OF CRITICAL DROUGHT SIMULATION,
California Univ., Los Angeles. Dept. of Engineering Systems.
A. J. Askew, W. W-G.. Yeh, and W. A. Hall.
Water Resources Research, Vol 7, No 1, p 52-62, February 1971. 11 p, 1 fig, 5 tab, 6 ref. OWRR Project B-061-CAL (6).

Descriptors: *Simulation analysis, *Droughts, *Streamflow, *Statistical methods, *Synthesis, Computers, Time, Cost, Reservoir design, River flow, Monthly.
Identifiers: *Critical periods, *Generating techniques, *Historical periods.

A set of monthly streamflow records was generated and analyzed to give a set of synthetic critical periods. The three characteristics used to compare the historical periods and the generated periods in relation to long-term yearly mean streamflow were: (1) minimum permissible constant extraction per year; (2) deficiency in streamflow accumulated during the critical period; and (3) duration of the critical period in months. Their respective means and standard deviations were used in computing values for the mean of the values of the three characteristics. All steps included in the analytical and synthetic sections of the generating techniques studied were shown and 10 generating techniques were described in detail. Twenty-six rivers were used therefore for each of the three critical period characteristics and four active storage capacities computed, a set of 26 mean values was obtained for each of the 10 generating techniques utilized. A study of the results allowed a comparison between the generating techniques in regard to both their computer time cost and their ability to synthesize critical droughts comparable to those recorded historically. Results were influenced by relative aridity of the watershed and by reservoir size. (Kriss-Cornell)
W71-05683

2F. Groundwater

GEOCHEMICAL HYDROLOGY OF THE GROUNDWATER IN BATON ROUGE, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W71-05348

SUMMARY OF GROUNDWATER HYDROLOGICAL DATA IN MICHIGAN FOR 1969,
Geological Survey, Lansing, Mich.
P. R. Giroux, and G. C. Huffman.
Geological Survey Data Report, 1970. 101 p, 43 fig, 2 tab, 92 ref.

Descriptors: *Hydrologic data, *Groundwater, *Water wells, *Michigan, Water levels, Data collections, Aquifers, Hydrographs, Water level fluctuations, Water table, Water supply, Withdrawal, Water treatment, Water utilization.
Identifiers: *Groundwater inventory (Michigan).

Records of groundwater levels in the principal aquifers of Michigan through 1969 are tabulated. Other related information including records of groundwater pumpage; data on municipal, public, and industrial water-supply facilities; and the effects of precipitation on groundwater levels are presented. Records of water levels in areas of heavy pumpage, and in areas where changes are principally from natural influences, are illustrated or tabulated to allow comparison between these types of water-level fluctuations. The water levels and related data provide a day-to-day record for the evaluation of available groundwater supplies. The long-term records serve as a framework to which short-term records may be related. During the first half of 1969, water levels in most wells continued the rising trend of the past several years. However, stages fell during the latter part of the year and were lower than at the end of 1968. During 1969, record-high levels were observed in 90 wells and record lows in 28. Most of the record lows occurred in heavily pumped areas, or at stations having only 2 to 3 years of record. (Woodard-USGS)
W71-05351

UNSTEADY UNCONFINED FLOW TO GRAVITY WELLS,
Leeds Univ. (England). Dept. of Civil Engineering.
J. A. Fox, and I. Ali.
Institution of Civil Engineers (London) Proceedings, Vol 40, Paper No 7098, p 451-469, August 1968. 19 p, 16 fig, 2 tab, 4 ref.

Descriptors: *Groundwater movement, *Waves (Water), *Unsteady flow, *Mathematical models,

Drawdown, Hydraulic models, Mathematical studies, Seepage, Water levels.
Identifiers: Shallow-water wave theory.

Shallow-water wave theory can be used to describe unsteady flow through porous media. The significant point of difference between this application and more usual ones is the much greater friction losses experienced by a fluid when moving through such media. The solution involves the integration of a pair of quasilinear hyperbolic partial differential equations. A modification of the method of characteristics programmed for a digital computer was the technique chosen. Good agreement between theoretical and experimental values was obtained. Because the single-well problem is symmetrical, a 15 deg sector only was investigated. A tank was buil5 deg sector of a 12 ft dia circle. It was instrumented and provided with facilities for generating specific boundary conditions. Depth gages which fed their output to a recorder continuously measured depths along a radial line in the tank. The porous medium chosen consisted of 5/8-inch crushed stone. Results were inaccurate close to the well where the groundwater surface was strongly curved. (Knapp-USGS)
W71-05356

HYDROGEOLOGIC DATA FOR THE UPPER HOUSATONIC RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 07C.
W71-05357

GROUNDWATER RESOURCES IN THE EASTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
I. H. Kantrowitz.
New York Water Resources Commission Basin Planning Report ORB-2, 1970. 129 p, 44 fig, 6 plate, 11 tab, 25 ref.

Descriptors: *Water resources development, *New York, *Aquifers, Groundwater, Withdrawal, Water quality, Water wells, Water supply, Saline water, Water chemistry, Data collections, Hydrologic data, Hydrogeology, Glacial drift.
Identifiers: *Oswego River basin (NY).

The Eastern Oswego River basin includes approximately 2,500 square miles in central New York. About 35% of the 600,000 people in the basin rely on groundwater supplies. Groundwater sufficient for domestic supplies can generally be obtained. Sources of large supplies, such as for industries or municipalities, are present but not widespread. The principal aquifers in the basin are unconsolidated deposits of sorted and stratified sand and gravel. The most prolific sand and gravel aquifers are those that are hyy connected to streams or rivers. The total potential yield of 16 such aquifers is about 280 mgd. Currently, less than 5 mgd is being withdrawn. Two bedrock units, the limestone and middle shale units, are capable of yielding large quantities of water. Groundwater in much of the Eastern Oswego River basin is of poor quality. Large parts of the basin are underlain by relatively shallow salty groundwater. A total of about 21 mgd is withdrawn from all aquifers of the area for public, domestic, industrial, and commercial supplies. This is only 2% of the estimated natural groundwater recharge of 1,000 mgd. (Knapp-USGS)
W71-05374

GROUNDWATER IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
A. E. Becher.
Available from Bureau of Publications, Tenth and Market Streets, Harrisburg, Penn 17125. Pennsylvania Geologic Survey Educational Series No 3, 1970. 42 p, 29 fig, 1 map, 2 tab, 46 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, *Hydrogeology, Water resources development, Evaluation, Geology, Aquifers, Aquifer characteristics, Precipitation (Atmospheric), Surface waters, Streamflow, Runoff, Meteorology, Evapotranspiration, Water yield, Specific capacity, Water table, Hydrologic data, Water utilization, Consumptive use, Water pollution, Water pollution sources, Water quality, Water rights, Planning.

The existing knowledge of the groundwater resources of Pennsylvania is summarized. It was written to provide industrial and civil planners, developers, managers, and the public with sufficient information about statewide water resources to make intelligent, fundamental decisions about the future use, development, and protection of the groundwater. Pennsylvanians used about 6.6 BGD (billion gallons per day) of water in 1966, excluding electric power plant use. Although only 11% of the water was taken directly from groundwater sources, 25 to 35% of the people depend on groundwater for their personal needs. In addition, 55% of water companies obtain all their water, and another 13% obtain part of their water, from groundwater sources. Twenty-one of the 67 Pennsylvania counties obtain more than half their total water supplies from groundwater. Both regional and local problems of water quality exist in Pennsylvania. Many of these problems are the result of activities undertaken in the past without adequately protecting water resources. Waters that flow from coal mines and contain high concentrations of sulfuric acid and iron in solution are the major problem of water quality both in the volume of water involved and the total area affected. Second to acid mine waters in areal extent, but equally serious, is the pollution of Pennsylvania's stream and groundwaters by sewage and industrial wastes. Another type of groundwater pollution is caused by crude oil and saline waters moving upward into fresh water aquifers either through natural openings or through oil and gas wells abandoned prior to the well plugging law of 1951. (Woodard-USGS)
W71-05377

THE RELATION BETWEEN THE CHLORIDE WATERS OF THE WESTERN BELORUSSIAN UPLAND AND THE ZONES OF TECTONIC DEFORMATION, (IN RUSSIAN),
Akademiya Navuk BSSR, Minsk. Laboratoriya Geokhimicheskikh Problem.
G. V. Bogomolov, and O. N. Shpakov.
Doklady Akademii nauk BSSR, Vol 4, No 4, p 348-350, 1970. 1 tab, 8 ref.

Descriptors: *Groundwater, *Hydrostatic pressure, *Hydrogeology, Wells, Chlorine.
Identifiers: Belorussia.

Belorussian upland, the most ancient formation of the European plain of Russia, is under hydrostatic pressure of the Pripiyat, Baltic, and Moscow depressions. The composition of groundwater is closely related to the geologic history of these territories, their submergence under the sea water and subsequent formation of calcareous, quartzite-glauconitic, and chalk sediments. High chlorine content in fresh subterranean waters is attributed to the buried, metamorphized water of the former sea basins. The water samples with high content of chlorine were obtained predominantly from well points located near tectonic deformations and within the local drainage areas. (Wilde-Wisconsin)
W71-05405

WATER RESOURCES - APPENDIX V OF COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY,
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 02A.
W71-05449

BIG BLUE RIVER BASIN APPENDIX.
Nebraska Soil and Water Conservation Commission, Lincoln.
For primary bibliographic entry see Field 02E.
W71-05451

PROCEDURE FOR COMPUTING THE ELASTIC SEEPAGE REGIME IN CONFINED AQUIFERS,
For primary bibliographic entry see Field 08B.
W71-05455

GROUNDWATER RESERVOIR RESPONSE TO EARTH TIDES,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geophysics.
Edwin S. Robinson.
In: Virginia Polytechnic Institute and State University Water Resources Research Center Bulletin 40, p 55-65, December 1970. 11 p, 2 tab, 8 ref. OWRR Project A-023-VA (1).

Descriptors: *Water level fluctuations, *Groundwater, *Water wells, Tidal effects, Virginia, Aquifers, Porosity, Storage coefficient, Permeability, Confined water.
Identifiers: *Earth tides.

A study was undertaken in Virginia to examine tidal water level fluctuations in wells, and to quantitatively relate observed tides and groundwater reservoir storage parameters. Data from thirty wells were examined, and tides were identified in twelve of these wells. The tides observed in water wells can be related to the porosity and bulk modulus of an aquifer by means of the equation presented. To establish this relationship one must have water level records, barometric records, and ocean tide records covering at least two weeks and preferably 29 continuous days. (See also W71-05555) (Knapp-USGS)
W71-05556

MOUNTAIN RUNOFF AND ITS RELATION TO PRECIPITATION, GROUNDWATER, AND RECHARGE TO THE CARBONATE AQUIFERS OF NITTANY VALLEY, PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02A.
W71-05560

A PROPOSED TECHNIQUE FOR IDENTIFICATION OF UNCONFINED AQUIFER PARAMETERS,
California Univ., Los Angeles.
William W-G. Yeh, and George W. Tauxe.
Journal of Hydrology, Vol 12, No 2, p 117-128, January 1971. 12 p, 2 fig, 2 tab, 8 ref.

Descriptors: *Linear programming, *Parametric hydrology, *Groundwater movement, *Computer programs, *Mathematical models, Systems analysis, Numerical analysis, Aquifers, Least squares method, Equations, Mathematical studies, Unsteady flow.
Identifiers: Quasilinearization.

The technique of quasilinearization is applied to the problem of identifying the parameters in an unconfined aquifer system. This new technique is shown to be a very effective way of converting field observations based upon pumping tests into the desired aquifer parameters. The procedure is straightforward as it requires neither curve plotting nor graphical matching. The parameters to be identified are the hydraulic conductivity and specific storage in an extensive unconfined aquifer system. Results and numerical experiments are presented. (Knapp-USGS)
W71-05591

ESTIMATING INFILTRATION AND/OR THEIR PARAMETERS OF UNCONFINED AQUIFERS FROM GROUNDWATER LEVEL OBSERVATIONS,
C. Venetis.
Journal of Hydrology, Vol 12, No 2, p 161-169, January 1971. 9 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Groundwater movement, *Infiltration, *Water level fluctuations, Hydraulic gradient, Permeability, Transmissivity, Water balance, Storage coefficient, Aquifers, Water table, Water levels.
Identifiers: Unconfined aquifers.

The mechanism of the interplay between groundwater recharge and depletion is examined and simple practical methods are developed for the estimation of infiltration from groundwater level observations. Estimates of the aquifer parameters may also be obtained when a long term water balance is possible. The relationship between infiltration and groundwater levels is analyzed through the linear differential equation of the groundwater flow. The theoretical results are simplified by approximation, and the parameters involved are lumped into three constants which depend only on the relative position of the point of observation. These can be directly estimated from the recession of recorded groundwater levels and a longterm water balance. (Knapp-USGS)
W71-05594

PLEISTOCENE STRATIGRAPHY OF THE SALISBURY AREA, MARYLAND, AND ITS RELATIONSHIP TO THE LOWER EASTERN SHORE: A SUBSURFACE APPROACH,
Maryland Geological Survey, Baltimore.
H. J. Hansen, III.
Maryland Geological Survey Report of Investigations No 2, 1966. 56 p, 12 fig, 6 tab, 42 ref.

Descriptors: *Aquifers, *Maryland, *Stratigraphy, *Coastal plains, Hydrogeology, Sampling, Water wells, Sedimentation, Quaternary period, Pleistocene epoch, Sea level.
Identifiers: Salisbury (Md).

The Salisbury, Maryland, water resources investigation afforded the opportunity for a detailed subsurface study of the Pleistocene Series beneath a 90-square-mile area surrounding the city. Twenty-four core holes and 15 test holes were drilled. From these new data emerged a clarification of the stratigraphic sequence. North of Salisbury a deep Pleistocene paleochannel was discovered. Filling in and overlying this paleochannel is the 'red gravelly' facies of the Salisbury Formation, a fluvial sand deposited by an aggrading river during a period of rising base-level conditions, possibly coincident with the Sangamon Interglaciation. The estuarine equivalent of the 'red gravelly' facies is the Beaverdam facies, a gray-white, fine to coarse-grained sand. The 'red gravelly' facies is thickest north and west of Salisbury; it wedges out easterly toward Parsonsburg and southerly toward Princess Anne. Complementing this is an easterly and southerly thickening of the Beaverdam facies. Overlying the Salisbury Formation is the Walston Formation, an extensively developed fine-grained sediment. The Parsonsburg Sand, a coastal dune deposit, overlies the Walston Formation in the divide area. The stratigraphic relationship between the Parsonsburg Sand and the Walston Formation reflects the transgressive advance of dune sand over a surrounding tidal marsh facies. By the end of late Wisconsin time the present-day drainage network was incised into the terrane. As sea level rose during the subsequent Holocene marine transgression, intercalated fluvial gravels and marsh muds were deposited in and adjacent to present-day rivers. (Knapp-USGS)
W71-05619

PHOSPHATE MOVEMENT IN SURFACE RUNOFF WATER,
Ministry of Works, Nelson (New Zealand). Moutere Soil Conservation Station.
For primary bibliographic entry see Field 05B.
W71-05625

PUMPING TEST PROCEDURES FOR AQUIFER ANALYSIS,
Michigan Dept. of Public Health, Lansing. Section of Water Supply.
Charles J. Linck.
Typescript, 1970. 8 p.

Descriptors: *Pumping testing, *Performance, *Groundwater, Thiems equation, Theis equations, Transmissability, Water wells, Observation wells.
Identifiers: *Jacob method, *Pizometer, Orifice meters.

Obtaining reliable data which are amendable to mathematical analysis is one of the purposes of a pumping test. Such data are usually obtained by pumping one well continuously, and at constant rate, while making periodic measurements on water level changes in nearby observation wells. A relatively simple task at first glance, but no one can be sure the data can be analyzed with available techniques. Present equilibrium and non-equilibrium methods of analysis make the classic four basic assumptions. These assumptions, however, are not factors which the field man can adjust for in setting up his test. The analyst while also not being able to adjust for them can attribute departures of the data to departures of the aquifer from the ideal. Other classic assumptions are discussed which can be met by proper field design. (Campbell-NWWA)
W71-05694

APPLICATION OF ELECTRICAL AND RADIOACTIVE WELL LOGGING TO GROUNDWATER HYDROLOGY,
Geological Survey, Washington, D.C.; and Pennsylvania State Geological Survey, Harrisburg.
For primary bibliographic entry see Field 04B.
W71-05697

GROUNDWATER HYDROLOGY FOR WATER WELL DRILLING CONTRACTORS,
Kent State Univ., Ohio. Dept. of Geology.
J. L. Rau.
National Water Well Association, Columbus, Ohio, 1970. 259 p.

Descriptors: *Hydrogeology, *Geomorphology, Geologic mapping, Aquifers, Aquicludes, Geologic formations, Aquifer characteristics, Artesian aquifers, Recharge, Logging (Recording), Water chemistry, Appalachian Mountain region, Atlantic Coastal Plain, Florida, Southeast U.S., Mineralogy, Igneous rocks, Sedimentary rocks, Metamorphic rocks, Hydrologic cycle, Springs.
Identifiers: *Topographic maps, *Geologic column, Rock unit correlation, Geologic cross-section construction, Record keeping, Aquifer test methods, Groundwater contamination.

The objective of this book is to present the basic geologic factors which control the occurrence, availability, and quality of groundwater. In an introductory treatment of this material the author believes it is more important to consider the principles of geology as they relate to the discovery and exploitation of groundwater rather than to develop the quantitative aspects of groundwater hydrology. Groundwater occurs in a geologica framework and unless the nature of the framework is understood an analysis of equations or computing procedures for developing various types of aquifers is of little use. Furthemore, this text is designed primarily for the water well drilling contractor who has had no formal training in geology, but it is also applicable to the general public. The author's treatment of groundwater hydrology and geology emphasizes the Eastern United States. (Campbell-NWWA)
W71-05699

2G. Water in Soils

THE PREDICTION OF UNSATURATED FLOW RATES FROM PHYSICAL PROPERTIES OF THE POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Soils.
Larry L. Boersma.
Available from NTIS as PB-197 880, $3.00 in paper copy, $0.95 in microfiche. Oregon State University Water Resources Research Institute Project Completion Report, December 31, 1970. 15 p, 7 fig, 7 ref. OWRR Project B-001-ORE (8).

Descriptors: *Soil water movement, *Unsaturated flow, *Permeability, *Porous media, Forecasting, Model studies, Equations, Porosity, Pervious soils, Soil properties, Pore pressure, Methodology, Gamma rays, Test procedures.
Identifiers: Mercury intrusion porosimeter, Pore size, Soil water characteristic curve.

The only methods which make it possible to obtain water transmission coefficients of porous media without the use of complicated experimental techniques are prediction methods based on physical properties of the medium. Simple laboratory techniques were developed to measure the physical properties needed in these prediction methods and to check these methods through a series of systematic measurements. Pore size distributions were determined by the mercury intrusion method. The mercury intrusion porosimeter is an instrument by which pressure can be applied to a reservoir of mercury in contact with a porous solid sample. Precise measurement of changes in the volume of mercury as the pressure is increased provides a measure of the volume of pores in a given size range. The permeabilities of the materials were measured with a constant head permeameter. Bulk densities and porosities were obtained with gamma ray attenuation equipment. A total of 63 samples was tested with permeabilities ranging from 1.5-39.1 square microns. The permeability of the inert porous materials considered can be predicted reliably when the pore size distribution is known. Mercury intrusion is an efficient and highly reproducible method to obtain the pore size distribution of soils. Mercury intrusion data can be used to provide the quantitative information required in transport models for water, heat and chemicals in porous media. (Woodard-USGS)
W71-05335

MOISTURE CHARACTERISTICS OF PENNSYLVANIA SOILS: III. PARENT MATERIAL AND DRAINAGE RELATIONSHIPS,
Pennsylvania State Univ., University Park. Dept. of Soil Genesis and Morphology.
G. W. Petersen, R. L. Cunningham, and R. P. Matelski.
Soil Science Society of America Proceedings, Vol 35, No 1, p 115-119, January-February 1971. 5 p, 5 fig, 3 tab, 17 ref.

Descriptors: *Soil moisture, *Soil-water-plant relationships, *Moisture content, Soil texture, Provenance, Soil types, Soil horizons, Soil physical properties, Porosity, Permeability, Soil formation.
Identifiers: Available moisture (Soil).

Available moisture (Wa), assumed to be the difference between moisture contents of 'undisturbed cores' equilibrated at 1/3 atm of tension and of sieved samples equilibrated at 15 atm of tension, was determined on samples collected from 207 profiles in 27 Pennsylvania counties. Weighted means of Wa, coarse fragments, sand, silt, and clay were calculated from A, B, and C horizons and for 0-30, 30-60, 60-90, and 90-120-cm depth increments for each soil profile, grouped according to parent material and drainage class. Parent material groups showed the following decreasing relative amounts of cumulative Wa: aeolian, alluvium, limestone, till, shale, sandstone, glacial-fluvial. Differences in Wa are related to textural relationships and course fragment contents, with Wa decreasing with increasing amounts of clay, sand, and coarse fragments. Wa generally decreased with increasing depth within each parent material group. Differences in the drainage were usually related to the parent material from which the soil developed. Therefore, differences in parent material should be the primary consideration when estimating Wa, and the effect of drainage conditions upon Wa should only be considered when these differences occur within a parent material group. (Knapp-USGS)
W71-05343

A CAPILLARY PERTURBATION STUDY OF TWO-PHASE FLOW INFILTRATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Alain G. Noblanc.
M. Sc. Thesis, November 1970. 64 p, 21 fig, 3 ref. OWRR Project B-033-Colo (3).

Descriptors: *Infiltration, *Unsaturated flow, *Soil water movement, *Model studies, *Capillary action, Water, Air, Darcy's law, Equations, Soil water, Porosity, Porous media, Saturation, Permeability, Flow characteristics, Mathematical models, Numerical analysis.
Identifiers: Buckley-Leverett equations.

This study presents an analytical treatment of unidimensional flow of two immiscible fluids, water and air, into a porous medium. From the principle of continuity and Darcy's law applied to both fluids, a second order partial differential equation is derived in terms of water saturation, time and depth into the medium. In this differential equation the effect of capillarity is represented by a perturbation term. Even though the equation is solved approximately, the effect of capillarity is not neglected. The knowledge of an approximate saturation profile leads to the determination of the rate of water infiltration by a new combination of Darcy's law and principle of continuity. A numerical solution was found for a fine sand, semi-infinite porous medium with several different boundary and initial conditions. Infiltration curves and saturation profiles are presented. (Woodard-USGS)
W71-05444

SORPTION AND DESORPTION OF CHLORINATED HYDROCARBON PESTICIDES BY CLAY MINERALS,
Missouri Univ., Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-05447

ON THE PROBLEM OF DERIVING A SYSTEM OF EQUATIONS DESCRIBING THE MOTION OF WATER-SATURATED COHESIONLESS SOIL CONSIDERED AS A MULTIPHASE MEDIUM,
For primary bibliographic entry see Field 08D.
W71-05458

STONE PAVEMENTS IN DESERTS,
University Coll., London (England). Dept. of Geography.
Ronald U. Cooke.
Annals, Association of American Geographers, Vol 60, No 3, p 560-577, September 1970. 14 fig, 76 ref.

Descriptors: *Geomorphology, *Deserts, *Weathering, *Wind pressure, *Environmental effects, Running water, Runoff, California, Particle size, Particle shape, Rocks, Landforms, Solubility, Mode of action, On-site investigations, Soil profiles, Alluvium, Soil horizons, Silts, Clays, Fine aggregates, Fine-textured soils, Soil types, Seepage, Sediments, Sediment distribution, Sedimentary structures, Raindrops, Salts, Vegetation effects, Creep, Desiccation, Frost action, Chemical degradation, Sands, Deposition, Gravels.
Identifiers: *Stone pavements, *Atacama Desert, *Deflation, *Mojave Desert.

Stone pavements are defined as armored surfaces comprising intricate mosaics of coarse particles, usually only 1 or 2 stones thick, that are set in deposits of sand, silt or clay. They occur widely, but most often in hot, little-vegetated deserts. Their formation has long been thought due to deflation, which is wind surface action causing the removal of lighter particles, leaving the heavier pebbles behind, which protect the underlying fine materials. It is argued that, in geomorphology, diverse processes working in differing areas from differing initial conditions often produce similar final forms, and that single-process explanations are usually naive. Pavement studies were therefore carried out in several deserts, concentrating mostly on the Mojave and Atacama. The resulting data were then used to construct likely alternative modes of pavement formation: (1) wash and creep processes (2) upward particular migration (through freezing and thawing cycles, saturation and desiccation cycles and alternate salt solution and recrystallization) (3) insolation weathering (4) frost weathering (5) salt weathering (6) chemical processes and (7) superficial disintegration processes. Each process is described. It is felt that deflation may be relatively unimportant and that running water and upward imgration processes abetted by superficial disintegration are probably quite important. It seems certain that pavement areas differ greatly in their ages, history and formation processes. (Casey-Arizona)
W71-05473

PSYCHROMETRIC MEASUREMENT OF SOIL WATER POTENTIAL: TEMPERATURE AND BULK DENSITY EFFECTS,
Washington State Univ., Pullman. Dept. of Soil Science.
G. S. Campbell, and Walter H. Gardner.
Soil Science Society of America Proceedings, Vol 35, No 1, p 8-12, January-February 1971. 5 p, 4 fig, 1 tab, 17 ref. USAEC Project AT (45-1)-1543, Project W-68.

Descriptors: *Chemical potential, *Bulk density, *Temperature, *Vapor pressure, Soil texture, Soil physical properties, Soil water movement, Humidity, Water temperature.
Identifiers: Water potential, Psychrometers, Matric potential.

Changes in soil water potential with temperature were determined using thermocouple psychrometers on samples of four soils. Change in soil water potential with temperature becomes greater as soils become drier. The finer textured soils showed a greater change in water potential with temperature than did coarser soils at similar water potentials. Water potential change with bulk density also was determined for samples of three soils. Little change was noted except on a clay subsoil sample. In most cases negligible differences will arise from measuring water potential at laboratory temperature rather than at the temperature existing in the field and from use of disturbed field samples with altered bulk density rather than undisturbed field soil. However, at water potentials below about -20 bars, temperature effects may become significant, especially in fine textured soils, and measurements on clay subsoils may be significantly affected by changes in bulk density. (Knapp-USGS)
W71-05604

STABILITY OF MONTMORILLONITES: 1. BELLE FOURCHE AND CLAY SPUR MONTMORILLONITES,
Washington State Univ., Pullman. Dept. of Soil Science.
J. A. Kittrick.
Soil Science Society of America Proceedings, Vol 35, No 1, p 140-145, January-February 1971. 6 p, 1 fig, 2 tab, 22 ref. FWQA Program 16060 DGK.

Descriptors: *Weathering, *Equilibrium, *Clay minerals, *Montmorillonite, *Kaolinite, Leaching, Chemical reactions, Thermodynamics, Solubility, Free energy.
Identifiers: *Clay mineral equilibria.

Montmorillonite has the variable chemical composition and the exchangeable ions that are typical features of the more complicated minerals that form in the weathering environment. Stability determinations are presented for montmorillonites from Belle Fourche, South Dakota and Clay Spur, Wyoming. A montmorillonite-kaolinite mixture established the montmorillonite-kaolinite join and demonstrated montmorillonite-kaolinite equilibria. The solution composition of several other samples helped define an experimental Belle Fourche-Clay Spur montmorillonite solubility line. A free energy change of -2468.5 plus or minus 0.3 kcal per mole was calculated for Belle Fourche and Clay Spur montmorillonites, based upon the assumption that Fe ion in solution was controlled by hematite. (K-Knapp-USGS)
W71-05605

AVAILABLE WATER AS RELATED TO EVAPOTRANSPIRATION RATES AND DEEP DRAINAGE,
Agricultural Research Service, Prosser, Wash.
D. E. Miller, and J. S. Aarstad.
Soil Science Society of America Proceedings, Vol 35, No 1, p 131-134, January-February 1971. 4 p, 2 fig, 4 tab, 8 ref.

Descriptors: *Field capacity, *Evapotranspiration, *Irrigation efficiency, *Drainage, Soil water movement, Water management (Applied), Percolation, Moisture content, Laboratory tests.
Identifiers: Deep drainage (Soil water).

Soil water movement following irrigation was evaluated for different rates of evapotranspiration and depths of irrigation in laboratory systems. Downward flow of soil water decreased as evapotranspiration rate increased. Under usual summer environmental conditions, evapotranspiration reduced deep drainage sufficiently to allow reasonable estimates of actual available water to be made from conventional field capacity data. Better estimates were obtained by adjusting sampling time according to expected evapotranspiration rates and the soil depth to be involved. The data show that large errors are probable in field measurements of evapotranspiration rates if deep drainage is ignored. (Knapp-USGS)
W71-05606

LOW-TEMPERATURE PHASES OF INTERFACIAL WATER IN CLAY-WATER SYSTEMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Duwayne M. Anderson, and Allen R. Tice.
Soil Science Society of America Proceedings, Vol 35, No 1, p 47-54, January-February 1971. 8 p, 13 fig, 2 tab, 19 ref.

Descriptors: *Clay minerals, *Soil moisture, *Differential thermal analysis, *Freezing, Frost, Cations exchange, Mineralogy, Thawing, Water chemistry, Soil water, Ice, Heat transfer.
Identifiers: Interfacial water (Clays).

Low temperature differential thermal analyses of selected clay-water systems were made to locate important phase change temperatures and to define fruitful temperature-pressure fields for precise calorimetric investigation. In addition to an exotherm corresponding to initial freezing, one, two or three exotherms were observed between -35C and-60C. The low temperature exotherms do not depend critically upon water content, but clearly they are related to clay mineral and exchangeable cation type. The evolution of heat in this temperature range probably corresponds to a phase change in the interfacial water. (Knapp-USGS)
W71-05607

MEASURING SOIL MATRIC POTENTIAL IN SITU BY SENSING HEAT DISSIPATION WITHIN A POROUS BODY: 1. THEORY AND SENSOR CONSTRUCTION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
C. J. Phene, G. J. Hoffman, and S. L. Rawlins.
Soil Science Society of America Proceedings, Vol 35, No 1, p 27-33, January-February 1971. 7 p, 7 fig, 1 tab, 11 ref.

Descriptors: *Soil water movement, *Heat flow, *Chemical potential, *Instrumentation, Porous media, Mathematical models, Moisture meters, Soil moisture meters, Calibrations, Moisture content, Bouyoucos blocks.
Identifiers: *Matric potential sensor.

A matric potential sensor measures heat dissipation to sense the water content of a porous block in equilibrium with soil. It consists of a P-N junction diode that is surrounded by a heating coil and embedded in a porous medium. A theoretical model describes the sensor in terms of its limiting parameters. Geometry, size, rate of heat input, and duration of heating are chosen to obtain a desired degree of accuracy and to make the measurements independent of the surrounding soil. Construction, calibration, measurement, and temperature correction techniques are described. Since the electrical output of the sensor is linear with temperature, a single calibration curve is adequate at all temperatures within the accuracy reported. By varying the composition of the porous body, the range and sensitivity of the sensor can be altered. (Knapp-USGS)
W71-05608

FLUX-GRADIENT RELATIONSHIPS FOR SATURATED FLOW OF WATER THROUGH MIXTURES OF SAND, SILT, AND CLAY,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. A. Russell, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol 35, No 1, p 21-26, January-February 1971. 6 p, 9 fig, 16 ref.

Descriptors: *Soil water movement, *Permeability, *Hydraulic gradient, *Clays, Hydraulic conductivity, Darcy's law, Porous media, Flowmeters, Expansive clays, Expansive soils, Groundwater movement.
Identifiers: Non-Darcian flow.

Water flux was studied as a function of hydraulic gradient for water-saturated mixtures of sand, silt, kaolinite, illite, and bentonite. Flow rates were measured in sensitive capillary-tube flowmeters containing differential manometers, such manometers also being used to measure gradients across the permeameters. Measurements were relatively rapid and were obtained for a series of increasing gradients followed immediately by repetition of alternate points in the direction of decreasing gradients. The method eliminated errors arising from time changes in hydraulic conductivity, evaporation loss at the flow outlet, and bubble movement in small-bore capillary tubes. Nonswelling mixtures (sand, silt, kaolinite, and illite) generally exhibited good Darcian proportionality between flux and gradient, except for two less-than-proportional responses, one of which could be accounted for by fine-particle migration. Swelling mixtures (sand, silt, and bentonite) yielded nonproportional flux-gradient curves of a generally sigmoidal shape. (Knapp-USGS)
W71-05609

CALCULATION OF HYDRAULIC CONDUCTIVITY: A FURTHER EVALUATION OF SOME PREDICTIVE METHODS,
Hawaii Univ., Honolulu. Dept. of Soil Science; and du Pont de Nemours (E.I.) and Co., Aiken S.C. Savannah River Lab.
R. E. Green, and J. C. Corey.
Soil Science Society of America Proceedings, Vol 35, No 1, p 3-8, January-February 1971. 6 p, 8 fig, 1 tab, 16 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, Model studies, Laboratory tests, Unsaturated flow, Infiltration, Computer programs, Mathematical models, Moisture content.
Identifiers: Hydraulic conductivity calculation.

A computational method based on the pore-interaction model of Marshall was shown to compare favorably with modified methods of Millington and Quirk and of Marshall for prediction of hydraulic conductivity vs. water content on a number of soils and a glass bead system. All methods required matching one point on the calculated hydraulic conductivity curve to an experimentally measured hydraulic conductivity value. The calculation methods adequately predicted the experimentally measured values and provide satisfactory conductivity data for many applications. An advantage of the proposed method is its independence of the value chosen for the exponent on the porosity term in the prediction equation. (Knapp-USGS)
W71-05610

MOISTURE RETENTION OF CULTIVATED AND PASTURED MOLLISOLS AND ALFISOLS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C. B. England.
Soil Science Society of America Proceedings, Vol 35, No 1, p 147-149, January-February 1971. 3 p, 3 fig, 1 tab.

Descriptors: *Soil structure, *Moisture content, *Soil-water-plant relationships, *Cultivation, Mathematical models, Land use, Data collections.
Identifiers: *Moisture retention.

Comparison of surface soil mositure characteristic curves for Mollisols and Alfisols under pasture and row-crop cultivation revealed that below 1/3 bar suctions cultivated Mollisols retained 40% more water and cultivated Alfisols retained 25% more than corresponding pastured soils. At tensions above 1/3 bar, cultivated soils of both orders held less water. (Knapp-USGS)
W71-05611

EFFECT OF TRICKLE IRRIGATION INTERVALS ON DISTRIBUTION AND UTILIZATION OF SOIL MOISTURE IN A VINEYARD,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation; and Ministry of Agriculture, Rehovoth (Israel).
S. D. Goldbert, M. Rinot, and N. Karu.
Soil Science Society of America Proceedings, Vol 35, No 1, p 127-130, January-February 1971. 4 p, 4 fig, 2 tab, 9 ref.

Descriptors: *Irrigation effects, *Soil chemical properties, *Soil water movement, *Crop response, *Leaching, Moisture content, Water utilization, Consumptive use, Irrigation design, Soil-water-plant relationships.
Identifiers: *Trickle irrigation.

In an established vineyard on sandy clay soil the effect of trickle irrigation interval on soil moisture and salt distribution and relative water use efficiency was examined. The distribution of soil moisture and salinity resulting from this irrigation method is two dimensional, with moisture contents high along and beneath the row and decreasing laterally. The main active soil layer supplying water to the roots was found to be restricted to a strip approximately 2 m wide and 120 cm deep beneath the rows, whereas the total distance between rows was 3 m. The effect of shorter irrigation intervals, with proportionally smaller amounts of water applied in a single irrigation, was to decrease the variations of moisture content in the root zone and establish a continuously higher moisture regime. Salts were concentrated in a surface pocket and a deep layer with a leached zone between them. The relative position of the concentration layers was determined by the amount of water applied in a single irrigation. Relative water use efficiency was positively affected by shorter irrigation intervals both in terms of grape production and weight of prunings. (Knapp-USGS)
W71-05612

NUMERICAL ANALYSIS OF SOIL-MOISTURE SYSTEMS,
Drexel Univ., Philadelphia, Pa. Dept. of Civil Engineering and Mechanics.
Irwin Remson, A. Alexander Fungaroli, and George M. Hornberger.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 93, No IR3, p 153-166, September 1967. 14 p, 9 fig, 2 tab, 12 ref, append.
NSF Grant GK-635.

Descriptors: *Soil moisture, *Unsaturated flow, *Numerical analysis, *Mathematical models, Evaporation, Hysteresis, Infiltration, Hydrogeology, Soil water movement.
Identifiers: Soil moisture analysis.

Soil-moisture systems are analyzed using a numerical technique and a digital computer. The technique is applicable to unsteady-flow systems in nonhomogeneous soils. Variable initial and boundary conditions may be considered. Nonlinear multivalued relationships between matrix moisture content, capillary potential, and hydraulic conductivity may be incorporated. The method is applicable in theory to one-, two-, or three-dimensional systems. A one-dimensional unsteady-flow system was analyzed and used to study the effects of evaporation and soil-moisture hysteresis on a draining mass of infiltrated rainfall. (Knapp-USGS)
W71-05621

PHOSPHATE MOVEMENT IN SURFACE RUNOFF WATER,
Ministry of Works, Nelson (New Zealand). Moutere Soil Conservation Station.
For primary bibliographic entry see Field 05B.
W71-05625

RHEOLOGICAL PROPERTIES AND BEARING CAPACITY OF FROZEN SOILS,
For primary bibliographic entry see Field 02C.
W71-05671

TILLAGE SYSTEM EFFECTS ON WATER USE EFFICIENCY,
Virginia Polytechnic Inst., Blacksburg. Dept. of Agricultural Engineering.
V. O. Shanholtz, and J. H. Lillard.
Journal of Soil and Water Conservation, Vol 24, No 5, p 186-189, Sept-Oct 1969. 5 fig, 4 tab, 6 ref.
OWRR Project A-018-VA (4).

Descriptors: *Water utilization efficiency, *Soil-water-plant relationships, *Evaporation control, Water conservation, ZEA Mays, Soil water, Soil temperature, Surface runoff, Plant growth.
Identifiers: *No tillage, *Conventional tillage, Corn plant growth.

A hydraulic performance of two radically different row crop tillage systems, conventional tillage and no tillage was studied in 1966, 1967, and 1968. A randomized complete block statistical design was used to evaluate differences in the two systems. The greatest difference in total available soil water always occurred at planting date and progressively decreased during the growing season. No significant differences at the 5% level could be detected below 24 inches. Superior growth and yields were observed on the no tillage system, which resulted in more efficient utilization of available water. The advantages are attributed to the significantly less surface runoff, evaporation, and to the generally more favorable physical root zone environment for superior plant development which this system provides.
W71-05720

2H. Lakes

GLACIAL GEOLOGY OF THE CHAMPLAIN VALLEY: 1966-1970,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 02C.
W71-05337

A PRELIMINARY STUDY OF THE RELATIONSHIPS BETWEEN STREAM WATER QUALITY AND WATERSHED CHARACTERISTICS FOR THE TRUCKEE RIVER,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 05A.
W71-05338

A CONSIDERATION OF POLLEN, DIATOMS AND OTHER REMAINS IN POSTGLACIAL SEDIMENTS,
Iowa State Univ., Dept. of Botany and Plant Pathology; and Iowa Lakeside Lab., Milford.
For primary bibliographic entry see Field 02J.
W71-05340

BAIKAL ARTESIAN WATERSHED, (IN RUSSIAN),
Nauchno-Issledovatelskaya Laboratoriya Geologii Zarubezhnykh Stran, Moscow (USSR).
N. A. Marinov.
Doklady Akademii nauk SSSR, Vol 191, No 4, p 897-900. 1 fig, 4 ref.

Descriptors: *Lakes, *Geomorphology, *Watersheds (Basins), Geothermal studies, Temperature, Hydrostatic pressure, Water properties.
Identifiers: *Lake Baikal (USSR).

A detailed description is given of the very complex geological features of the Baikal watershed formed by recent tectonic deformations that imparted to Lake Baikal its maximum depth of 1620 m over a 5 km deep crystalline foundation. The outstanding peculiarity of this geomorphological area is the presence of a 2500 m deep sheet of fresh subterranean water. The depressions of the watershed exhibit an augmented geothermal regime with water as the depth of about 2000 m attaining temperature from 75 to 90C. The deep layers of water are enriched in hydrogen, methane, heavy hydrocarbons, hydrogen sulfied, and carbon dioxide. The high hydrostatic pressure converts the Baikal depression into the world's largest artesian well of high water exchange dynamics. The youthful age of Baikal waters is disclosed by the presense of tritium in the deepest horizons of the lake. (Wild-Wisconsin)
W71-05394

EXPERIMENTAL INVESTIGATION OF THE PRODUCTION OF BACTERIA IN WATER AND CONSUMPTION OF BACTERIA BY DAPHNIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennikh Vod.
For primary bibliographic entry see Field 05F.
W71-05397

POLLUTION, OCEANOLOGY AND LIMNOLOGY IN THE GREAT LAKES,
Northeastern Illinois State Coll., Chicago. Dept. of Geography.
Roger H. Charlier.
Marine Technology Society Journal, Vol 4, No 3, p 59-68, 1970. 2 fig, 3 tab, 47 ref.

Descriptors: *Water pollution, *Limnology, *Oceanography, *Great Lakes, Meteorology, Evaporation, Precipitation (Atmospheric), Interfaces, Winds, Climates, Atmosphere, Inflow, Groundwater, Soil moisture, Energy budget, Heat, Currents (Water), Seiches, Diffusion, Waves (Water), Shores, Water levels, St Lawrence Seaway, Algae, Eutrophication, Fish, Bacteria, Organic wastes, Oil wastes, Viruses, Thermal pollution, Radioactive wastes, Potamology, Salinity, Temperature, Geology, Illinois, Wisconsin, Michigan, Indiana, Pennsylvania, Ohio, New York, Minnesota, Costs.
Identifiers: Outflow, Bottom processes.

The Great Lakes provide a challenging area for research in limnology, potamology, oceanology, and fisheries biology. Fifteen agencies of the federal government in the departments of Interior, Agriculture, Defense, and Commerce are involved in research, surveys, and studies. At the international level, the International Joint Commission, the Great Lakes Study Group, and the Great Lakes Fishery Commission deal directly with problems; at least 17 private corporations are directly connected with Great Lakes research, use, and marketing. By 1967, research programs were conducted by Canadian federal government agencies, by Ontario government and its agencies, and by universities and research foundations. In the United States, universities, state agencies, and the federal government and one private industry carried on investigations. Programs were proposed on lake meteorology, terrestrial water budget, energy balance and water movement. Major benefits are expected from the use of Lake Ontario as a model ocean in the study of air-water interface problems, water level variations, climate modification by large water bodies, ice formation and dissipation, water movements, evaporation measurement techniques and the physical factors influencing eutrophication, pollution, and sedimentation. (Jones-Wisconsin)
W71-05398

LAKES: THE VALUE OF RECENT RESEARCH TO MEASURE EUTROPHICATION AND TO INDICATE POSSIBLE CAUSES,
Marine Dept., Rotorua (New Zealand). Fisheries Research Division.
For primary bibliographic entry see Field 05B.
W71-05401

PREDICTION OF SOLAR AND ATMOSPHERIC RADIATION FOR ENERGY BUDGET STUDIES OF LAKES AND STREAMS,
Florida Univ., Gainesville.
W. C. Huber, and Armando I. Perez.
Florida Water Resources Center Completion Report, October 29, 1967. 128 p, 11 fig, 2 tab, 25 ref, 2 append. OWRR Project A-014-FLA (1).

Descriptors: *Energy budget, *Solar radiation, *Lakes, *Reservoirs, Surface waters, Hydrologic cycle, Thermal pollution, Thermal stratification, Water temperature, Evaporation.
Identifiers: Atmospheric radiation.

Evaluation of terms in the energy budget is an integral part of the prediction of thermal changes in natural water bodies. Lakes, reservoirs, streams, and tidal waters receive heat from shortwave solar radiation, longwave atmospheric radiation, and advectively from surface water inflows. The net advective heat flux is often zero, in which case the radiation components are the dominant causes of temperature changes. Predictive methods for the two radiation components were developed as a function of meteorological parameters alone (temperature, humidity, cloudiness, opaqueness). These predictive methods can be used in areas where there are no records of radiation measurements, because the required meteorological variables are commonly measured near by. A better predictive equation was found for shortwave radiation than for longwave radiation. Use of the shortwave equations in evaluating temporal temperature changes in a Florida lake resulted in good agreement with measured values. A tabulation of 148 days of hourly radiation and meteorological values is included in the report. (Knapp-USGS)
W71-05450

TWELFTH CONFERENCE ON GREAT LAKES RESEARCH,
Michigan Univ., Ann Arbor. Great Lakes Research Div.; and Bureau of Commercial Fisheries, Ann Arbor. Great Lakes Fishery Lab.
David C. Chandler, and George Y. Harry.
Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, 1969. 923 p.

Descriptors: *Conferences, *Limnology, *Great Lakes, Lake Superior, Lake Huron, Lake Michigan, Lake Ontario, Lake Erie, Water pollution effects, Bottom sediments, Sedimentation, Sampling, Water quality, Water balance, Water resources development, Water management (Applied).
Identifiers: Great Lakes Research Conference.

The Twelfth Conference was held May 5-7, 1969, at Ann Arbor, Michigan, co-hosted by the Great Lakes Fishery Laboratory of the U.S. Bureau of Commercial Fisheries and the Great Lakes Research Division of the University of Michigan. Emphasis in the general sessions was on the resource values of the Great Lakes and their role in the national program of marine science. Authorities at the regional and national levels from Canada and the United States were participants in these general sessions. Contributed papers covered the usual scientific disciplines in addition to special topics such as: resource management and economics; water management; limnological engineering; and physical lake models. The symposia were on quaternary history of the Great Lakes region, pesticides and the Great Lakes, the potential application of remote sensing to Great Lakes problems, and instrumentation for studies in physical limnology. (See also W71-05562 thru W71-05571) (Knapp-USGS)
W71-05561

NEARSHORE SEDIMENT SURVEY OFF WESTERN LAKE ONTARIO, METHODS AND PRELIMINARY RESULTS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 02J.
W71-05562

GEOCHEMISTRY OF LAKE MICHIGAN MANGANESE NODULES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
Ronald Rossmann, and Edward Callender.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 306-316, 1969. 11 p, 3 fig, 6 tab, 14 ref. FWQA Grant WP-00311 NSF Grant GA 1337.

Descriptors: *Geochemistry, *Manganese, *Lake Michigan, *Bottom sediments, Provenance, Water chemistry, Chemical precipitation, Iron, Sedimentation, Sediment-water interfaces, Organic matter, Leaching, Oxidation-reduction potential, Great Lakes.
Identifiers: Green Bay (Lake Michigan).

Manganese nodules, similar in composition to other freshwater and shallow marine nodules, occur on the sediment surface of Green Bay and northern Lake Michigan. Samples have been analyzed for their iron, manganese, calcium, magnesium, sodium, potassium, inorganic carbon, organic carbon, and total nitrogen content. The nodules average 20% iron and 6% manganese. The trace metal content (copper, zinc, cobalt, and nickel) of the samples is considerably lower than that of marine material. Interstitial water is one of the major contributors of manganese and iron for the growth of nodules in Lake Michigan. Cores of Green Bay sediment show an inverse relationship between sedimentary and interstitial manganese with the sedimentary manganese increasing to a maximum at or near the sediment-water interface. Sedimentary iron remains fairly constant throughout the length of these cores while interstitial iron decreases slightly toward the sediment-water interface. In addition, lake water may be more than a passive contributor of iron and manganese. There are indications that as much as one-half of the manganese found in lake water is particulate. The source of this material is believed to be the iron deposits of the Canadian Shield that have been subsequently leached of manganese and iron. (See also W71-05561) (Knapp-USGS)
W71-05563

PROFILES BETWEEN MANITOULIN ISLAND AND TOBERMORY (BRUCE PENINSULA),
Huntec Ltd., Toronto (Ontario).
J. W. Prior.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association

for Great Lakes Research, p 300-305, 1969. 6 p, 4 fig, 3 ref.

Descriptors: *Profiles, *Sounding, *Seismic studies, *Bathymetry, *Lake Huron, Bottom sediments, Topography, Sedimentation, Cores, Sampling, Great Lakes.
Identifiers: Georgian Bay (Lake Huron).

Two hydrographic and seismic profiles were run in Lake Huron between Tobermory and Fitzwilliam Island as part of a pipe line feasibility study. The study showed that the shortest course was unsuitable with many rock ledges on lake bottom. A more easterly course showed a predominantly sediment covered lake floor. A gorge within the bedrock east of Yeo Island is observed to trend and deepen to the north east. (See also W71-05561) (Knapp-USGS)
W71-05564

ORGANIC MATTER IN THE SEDIMENTS OF LAKES ONTARIO AND ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 02J.
W71-05565

ANALYSIS OF SEDIMENT CORES FROM BIG MUSCAMOOT BAY AND GOOSE BAY IN THE ST. CLAIR RIVER DELTA,
Wayne State Univ., Detroit, Mich.
For primary bibliographic entry see Field 02J.
W71-05566

HIGH RESOLUTION REFLECTION SEISMIC SURVEY IN WESTERN LAKE ERIE,
Geological Survey of Canada, Ottawa (Ontario); Geological Survey of Canada, Burlington (Ontario); and Ohio State Geological Survey, Sandusky.
George D. Hobson, C. E. Herdendorf, and C. F. M. Lewis.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 210-224, 1969. 15 p, 9 fig, 13 ref.

Descriptors: *Surveys, *Bathymetry, *Seismic studies, *Stratigraphy, *Lake Erie, Bottom sediments, Glacial drift, Sounding, Ohio, Topography, Profiles, Great Lakes.
Identifiers: *Seismic survey (Lake Erie).

The Geological Survey of Canada, in cooperation with the Ohio Geological Survey, undertook a continuous marine seismic profiling survey in the western part of Lake Erie during August-September 1968. Seismic coverage, totalling 818 mi, was obtained approximately every 5 minutes of latitude and longitude west of Point Pelee in both Canadian and United States waters. Record quality varies considerably over the survey area. East of Pelee and Kelleys Islands, data are good and provide a reliable interpretation of thickness of bottom sediments and stratification within them. The westernmost portion of the basin, yields poor data; this is probably due to gaseous organic material, sand bodies, or buried peat deposits. Drift thickness from drill holes and from the survey correlate well and range from zero up to 120 ft. A major reflector within the drift indicates the surface of glacial deposits and the general pattern of late glacial and postglacial drainage during low-level phases of Lake Erie. Offshore bedrock elevation varies between 390 and 571 ft above sea level. Bedrock highs underlie Point Pelee and the islands whereas bedrock lows in inter-island areas and the central basin are readily outlined. An interpretation of preglacial drainage is presented. (See also W71-05561) (Knapp-USGS)
W71-05567

CHARACTERISTICS OF LAKE MICHIGAN BOTTOM PROFILES AND SEDIMENTS FROM LAKESIDE, MICHIGAN TO GARY, INDIANA,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-05568

SEDIMENTS AND GEOLOGY OF BOIS BRULE RIVER, WESTERN LAKE SUPERIOR,
Wisconsin State Univ., Superior. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-05569

GEOCHEMICAL CHARACTERISTICS OF LAKES MICHIGAN AND SUPERIOR SEDIMENTS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 02J.
W71-05570

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
John Carroll Univ., Cleveland, Ohio; and Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05A.
W71-05571

CHEMICAL COMPOSITION OF SOME INLAND SURFACE WATERS AND LAKE DEPOSITS OF NEW SOUTH WALES, AUSTRALIA,
Monash Univ., Clayton (Australia). Dept. of Zoology.
W. D. Williams, K. F. Walker, and G. W. Brand.
Australian Journal of Marine and Freshwater Research, Vol 21, No 2, p 103-116, December 1970. 14 p, 2 fig, 5 tab, 25 ref.

Descriptors: *Water chemistry, *Lakes, *Salinity, Arid lands, Brines, Water quality, Sampling, Data collections, Phosphates, Nitrates, Chlorides, Sedium, Bicarbonates, Sulfates.
Identifiers: *Australia, *New South Wales (Australia).

Chemical data are presented for several lakes and two impoundments on the Kosciusko and Monaro plateau in south-eastern New South Wales, Australia, and for two rivers (Paroo and Darling), several freshwater lakes, and deposits from some dry salt lakes in western New South Wales. The concentrations of the major cations and anions, nitrate, and orthophosphate were investigated. For lake deposits, only major ions were investigated. The Kosciusko lakes were extremely fresh and chemically dominated by sodium and either bicarbonate, chloride or sulphate ions; the Monaro peneplain lakes had a considerable salinity range (69-21,244 p.p.m.), and, with increasing salinity, sodium and chloride assume dominance. The Paroo and Darling Rivers had salinities less than 400 p.p.m. and the western freshwater lakes less than 850 p.p.m.; in both rivers and lakes, sodium and bicarbonate were the dominant ions. Deposits from dry salt lakes were mainly sodium chloride. (Knapp-USGS)
W71-05616

SEDIMENT-WATER NUTRIENT RELATIONSHIPS - PARTS 1 AND 2,
Federal Water Quality Administration, Cincinnati. Field Investigations Branch.
For primary bibliographic entry see Field 05B.
W71-05626

BANGIA ATROPURPUREA (ROTH) A. IN WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W71-05630

2I. Water in Plants

POTENTIAL USEFULNESS OF ANTITRANSPIRANTS FOR INCREASING WATER USE EFFICIENCY IN PLANTS,
California Univ., Davis. Water Resources Center.
Robert M. Hagan, and David C. Davenport.
Available from NTIS as PB-197 930, $3.00 in paper copy, $0.95 in microfiche. California University Water Resources Center Technical Completion Report W-174, December 1970. 66 p, 27 fig, 26 tab, 30 ref. OWRR Project B-054-CAL (1).

Descriptors: *Water conservation, *Soil-water-plant relationships, *Evapotranspiration control, *Transpiration control, Plants, Chemcontrol, Thin films, Application methods, Water loss, Moisture content, Retardants, Surface tension, Hydrometry, Photosynthesis, Vegetation, Leaves, Consumptive use.
Identifiers: Water balance control (Plants).

Antitranspirants conserve water and maintain favorable plant water balances by reducing stomatal apertures, by forming a thin film over the leaves, or by reflecting excessive radiation. Under normal conditions, reductions in both transpiration and photosynthesis are to be expected, but reduction in growth does not always occur, and need not always be disadvantageous when it does. Antitranspirant effects on stomata were judged indirectly by porometry (mass flow or rate hygrometer), and directly by microscopic measurement of stomatal apertures from epidermal peels. The relationship between diffusive resistance and stomatal aperture was determined. It was found that a film antitranspirant, by increasing plant water potential, actually increases the aperture of stomata lying immediately under it. Direct stomatal measurements enabled assessment of the effects of the stomatal-closing antitranspirant, phenylmercuric acetate (PMA). It was discovered that PMA not only retards stomatal opening, but also retards closure, thereby increasing transpiration under conditions of low light or low water supply. The effects of various alkenylsuccinic acids (stomatal-closing antitranspirants which do not contain heavy metals) on the rates of transpiration and photosynthesis were measured. (Woodard-USGS)
W71-05443

PRODUCTION, CRUDE PROTEIN, AND USE OF 11 IRRIGATED GRASSES AND ALFALFA-GRASS COMBINATIONS ON CLAY SOILS IN WESTERN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Range Management.
For primary bibliographic entry see Field 03F.
W71-05464

SELECTED CHARACTERISTICS OF REPRESENTATIVE IRRIGATED AND DRYLAND FARMS AND RANCHES IN THE BELLE FOURCHE AREA,
Economic Research Service, Brookings, S. Dak.
For primary bibliographic entry see Field 03F.
W71-05466

VEGETATION COMPARISONS BETWEEN THE MEDITERRANEAN CLIMATIC AREAS OF CALIFORNIA AND CHILE,
Stanford Univ., Calif. Dept. of Biological Sciences.
H. A. Mooney, E. L. Dunn, Frances Shropshire, and Leo Song.
Supported by the NSF (GB 5223 and GB 8184) and the Ford Foundation's University of California-University of Chile Convenio. Flora, Vol 159, No 5, p 480-496, 1970. 3 fig, 3 tab, 25 ref.

Descriptors: *Plant populations, *Climatic zones, *Vegetation, *Shrubs, *Trees, Arid lands, Semiarid climates, Temperature, Precipitation (Atmospheric), Soil moisture, Environmental effects,

Ecology, Drought tolerance, Xerophytes, Habitats, Gradation, Distribution, Moisture availability, Geographical regions, Biological communities, California, Comparative productivity, Altitude, Forests.
Identifiers: *Chile, *Mediterranean climates, *Evergreens, *Succulents.

The Mediterranean regions of the world are widely separated and have taxonomically quite unrelated floras. However, they possess vegetations with comparable functions and physiognomies. In terms of climatic gradients, topographic configurations and land-use histories, Chile and California are the most comparable Mediterranean-Climatic regions, thus facilitating extremely direct vegetation comparisons. Both areas have the same general vegetation gradients. Going from the mesic to the arid end of the climatic gradient, homologous plant community types occur: closed evergreen forest, dense evergreen scrub, low scrub with many drought-deciduous elements and low scrub with many succulents. There are no common genera between the 2 regions, making clear that any structural similarities must be due to evolutionary convergence. Precipitation gradients extended from 80-1600 mm and latitudes spanned from 30-43 deg. There is a remarkable alignment of homologous community types with equal low elevation climatic regions. The very arid areas have sparse vegetation composed of slow-growing succulents and a diversity of drought-evading and enduring forms. With somewhat less aridity, the dominant forms are drought deciduous shrubs. Only evergreens that are very specialized occur. At the evergreen scrub level, soil water is available at depth, hence most shrubs are deep-rooted. Internal convergence is highest at this level but there is a degree of discordance between California and Chile. Low evergreen scrub in Chile has more drought-deciduous elements than California. Also, the rich Montane forests of the Sierra Nevada are lacking in the Andes. There are also equal latitudinal replacements of community types. (Casey-Arizona)
W71-05470

EFFECTS OF ENVIRONMENT ON RELATIONS BETWEEN EXTENSION AND CAMBIAL GROWTH OF POPULUS EUPHRATICA OLIV.,
Tel Aviv Univ. (Israel). Dept. of Botany.
Nili Liphschitz, and Yoav Waisel.
New Phytologist, Vol 69, No 4, p 1059-1064, October 1970. 2 fig, 1 tab, 8 ref.

Descriptors: *Cottonwoods, *Soil-water-plant relationships, *Plant growth, *Environmental effects, *Xylem, Plant tissues, Vascular tissues, Trees, Mode of action, Ecology, Slopes, Canyons, Regression analysis, Semiarid climates, Correlation analysis, On-site data collections, Equations.
Identifiers: *Israel, *Cambium, *Shoots.

P. euphratica, a native of Israel, exhibits several growth processes and a wide variety of wood types. Twenty-one adult trees growing on the eastern slope of a canyon near a stream were measured for annual increments of shoot elongation for several years in an effort to establish relationships between shoot elongation and cambial initiation in diffuse and ring porous trees. The habit was classified by levels on the basis of water supply: (1) water level; (2) mid-level, wet; (3) mid-level, dry and (4) slope level, dry. Growth was compared among trees at the various levels. Regressions of annual increment were performed on width of the current ring, width of the former extension increment ring, and mean width of annual extension growth. Shoot elongation of trees on dry sites was restricted and associated with narrow annual rings and ring porous wood. On wet sites, vigorous shoot growth was associated with wide annual rings and diffuse porous wood. Cambial growth characteristics are clearly correlated with shoot elongation and environmental influences are indirect. (Casey-Arizona)
W71-05471

RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS; II. ION FLUXES ACROSS ROOT CORTEX,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
H. Ginsburg, and B. Z. Ginzburg.
Supported by US Department of Agriculture Grant FG-IS-191, Project No A10-SWC-31. Journal of Experimental Botany, Vol 21, No 68, p 593-604, August 1970. 5 fig, 7 tab.

Descriptors: *Tracers, *Ion exchange, *Ion transport, *Root systems, *Estimating equations, Anion exchange, Cation exchange, Chlorides, Sodium, Potassium, Calcium, Phosphates, Water balance, Mode of action, Laboratory tests, Plant physiology, Absorption, Metabolism, Permeability, Membrane processes, Flow, Flow measurement, Radiochemical analysis, Instrumentation, Cytological studies.
Identifiers: *Metabolic inhibitors, *Reflection coefficients, *Osmotic flow.

Unidirectional radial fluxes of tagged Na, Cl and phosphate ions were measured across root 'sleeve' preparations. Since these preparations are extremely similar to epithelial preparations such as frog skin, active and passive ionic movements could be differentiated by use of the Ussing flux equations. At any given concentration, cation fluxes were 1 to 3 orders of magnitude greater than anion fluxes. The flux ratios indicated cation movement was largely passive while anion movement was dependent upon active cell pumping. The Cl influx was inhibited by KCN and increased by DNP, while K fluxes were unaffected by both metabolic inhibitors. Steady-state flux equations yield permeability coefficient values from which apparent diffusion coefficient values may be calculated. The resulting data indicate that radial ion movements must be through, rather than between, root cells. Anion movements are probably linked to the electron-flow system and not to ATP. Data must be interpreted cautiously, however, in view of endodermal damage. (Casey-Arizona)
W71-05474

PROSPECTS FOR PHOTOSYNTHESIS FROM A.D. 1970 TO A.D. 2000,
Nottingham Univ. (England). Dept. of Physiology and Environmental Studies.
J. L. Monteith.
Weather, Vol 25, No 10, p 456-462, October 1970. 1 fib, 2 tab, 9 ref.

Descriptors: *Photosynthesis, *Carbon dioxide, *Acrosols, *Solar radiation, Estimating equations, Respiration, Crop response, Oceans, Productivity, Atmosphere, Forecasting.
Identifiers: *Insolation, Dry matter.

The rate at which world dry matter is being accumulated at any given time is dependent upon the balance between photosynthate production and it's loss by respiration. Production (Photosynthetic rate) depends upon water, carbon dioxide and solar radiation in the 0.4-0.7 micrometer waveband. It is usually independent of temperature between 10-30C. Respiration rate depends upon the current amount of dry matter accumulated by the plant, photosynthetic rate and temperature. Using projected figures for carbon dioxide release into the atmosphere and assuming two-thirds of it will dissolve into the oceans, it is calculated that the atmospheric content will increase from the current level of 314 p.p.m. to 380 p.p.m. by 2000 A.D. The evidence for insolation decrease by particular scattering is conflicting. Therefore, the estimates of photosynthesis in 2000 A.D. were calculated for 2 plausible cases: (1) Carbon dioxide increasing to 380 p.p.m.; insolation constant; (2) carbon dioxide increasing to 380 p.p.m. and insolation decreasing by 1%/yr. Using condition (1) calculations indicate a 9% increase in gross photosynthesis between 1970-2000. Using (2), there should be a 0% change. Although the figures in themselves should cause no alarm, the author warns a number of contingencies. Even with a 9% increase, population growth will consume the added crop production. Further, changes in the Earth's heat balance could increase respiration, thereby decreasing net productivity. It is stressed that such long-term predictions are extremely unreliable. (Casey-Arizona)
W71-05475

TERRESTRIAL DESERT ARTHROPODS: FAUNA AND ECOLOGY,
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
Ronald R. Shmoller.
The Biologist, Vol 52, No 3, August 1970, p 77-98. 2 fig, 28 ref.

Descriptors: *Deserts, *Insects, *Ecology, *Indicators, *Environmental effects, Heat resistance, Diapause, Microenvironment, Insect resistance, Entomology, Animal physiology, Insect behavior, Environment, Drought tolerance.
Identifiers: *Species, *Adaptation, Namib Desert.

This paper examines the environmental relationships of terrestrial desert arthropods. The taxa of both the North American deserts and the Namib Desert of southwest Africa indicate very long periods of adaptation to desert conditions. Numerically dominant desert arthropods are mites, scorpions, spiders, grasshoppers, true bugs, homopterans, bettles, flies, and hymenopterans. Of the worldwide indicator species for deserts, possibly the best are the darkling beetles. Others are solpugids, robber flies, beeflies, and some cockroaches. Less important indicators are also given. Most desert arthropods are nocturnal or crepuscular, and the season of activity often coincides with moist periods. Many enter diapause to avoid dry, hot, or cold seasons. Many desert arthropods are burrowers, and larvae often live in the soil or under rocks. Adaptations of desert-inhabiting arthropods include lack of need for drinking water, waxy cuticle, urtocotelic excretory system, color adaptations, dense pubescence, reflective cuticle, subelytral air spaces, thick exoskeleton, large size, long legs, high temperature tolerance, behavioral adaptations to heat, flightless adaptation to wind, extreme agression in carnivores, and the ability to survive for long periods without food. (Yensen-Arizona)
W71-05478

INTERRELATIONS BETWEEN GROWTH AND PHOTOSYNTHESIS OF SALTBUSH (ATRIPLEX HALIMUS L.) GROWN IN SALINE MEDIA,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
J. Gale, and A. Poljakoff-Mayber.
Supported by U.S. Department of Agriculture Grant (PL-480, Project No A10-SWC-7). Australian Journal of Biological Sciences, Vol 23, No 5, p 937-945, October 1970. 4 fig, 1 tab, 15 ref.

Descriptors: *Halophytes, *Plant growth, *Photosynthesis, *Salinity, *Osmotic pressure, Xerophytes, Laboratory tests, Transpiration, Plant physiology, Carbon dioxide, Sodium chloride, Sodium sulfate, Leaves, Stomata, Plant morphology, Resistance, Salts, Absorption.
Identifiers: *Succulence, *Leaf area, *Water potential, *Leaf mesophyll.

Some Atriplex species may require small amounts of salt for optimum growth. A study was made of the growth of A.halimus under various saline conditions, in which the effects of NaCl and Na sulfate in the nutrient media were compared. Accompanying changes in leaf transpiration and photosynthesis were also measured. Either salt at low concentrations in the growth media stimulated total leaf area, succulence and overall growth. At osmotic pressures less than -5 atm, growth depression resulted. Salinity responses apparently operated through different mechanisms, since sap osmotic potentials in NaCl-exposed plants underwent osmostic adjustment while the Na sulfate-exposed plants showed only a partial osmotic adjustment. As salinity increased, stomatal resistance to water loss and carbon dioxide uptake increased, offsetting the low salinity beneficial effects of greater leaf surface area for transpiration and photosynthesis. High

NaCl concentrations and all Na sulfate concentrations increased mesophyll resistance to carbon dioxide uptake, which also acted to decrease photosynthesis. Finally, as salinity increased, lateral bud sprouting increased, implying a reduction in apical dominance. Possibly salinity disrupted plant hormonal balance. (Casey-Arizona)
W71-05480

GENETIC PROBLEMS OF HOT DESERT POPULATIONS OF SIMPLE TECHNOLOGY,
Newcastle-upon-Tyne Univ., (England). Lab. of Human Genetics.
D. F. Roberts.
Contribution to a Symposium on Climatic challenge and Population Pressure, London, 30 November 1968. Human Biology, Vol 42, No 3, p 469-485, September 1970. 4 fig, 24 ref.

Descriptors: *Arid lands, *Genetics, *Social aspects, *Cultural control, *Water shortage, Social behavior (Animals), Environmental effects, Mode of action, Ecology, Human population, Human resources, Biomass, Habitats, Animal behavior, Food chains.
Identifiers: *Adaptation, *Australia, *Aborigines.

Human inhabitants of hot deserts are pictured as carnivores on top of a fragile food chain limited in biomass because of limitations in plant growth. The mechanism of survival of primitive technology populations in hot deserts is universal--the use of some animal intermediary, whether hunted or herded, which is adapted to survival on meager desert resources. It follows that human desert populations must be small and mobile. Mammal home range sizes as functions of body weight and basal metabolism are considered, and human population density as a function of rainfall is quantitized. The survival of human desert populations may involve either or both of the phenomena of developmental adaptations or genetic adaptations. The genetic adaptations involve 4 interacting component problems: (1) habitation of extreme environments; (2) colonizing populations; (3) migrant populations; (4) small scattered populations. The problems are outlined, but unfortunately, critical data for their resolution are lacking. The intensity of selection is unknown and therefore the extent of polymorphism in desert populations is problematical. A consideration of colonization presents the problem of defining appropriate components of fitness, leasing to the apparent paradox of selection against high fertility. The small populations have theoretical genetic inbreeding problems, but this may be compensated for by cultural factors which mitigate against excessive inbreeding while maintaining high genetic drift possibilities. (Casey-Arizona)
W71-05481

CHLORIDE INFLUX INTO CITRUS LEAF SLICES,
South Australian Dept. of Agriculture, Adelaide; and Adelaide Univ. (Australia). Dept. of Botany.
J. B. Robinson, and F. A. Smith.
Supported by grants from the Australian Research Grants Committee and the Citrus Industry Research Trust Fund. Australian Journal of Biological Sciences, Vol 23, No 5, p 953-960, October 1970. 8 fig, 2 tab, 18 ref.

Descriptors: *Citrus fruits, *Leaves, *Chlorides, *Metabolism, *Inflow, Plant physiology, Osmotic pressure, Sodium, Potassium, Calcium, Sulfates, Energy transfer, Laboratory tests, Mode of action, Salinity, Tracers, Radiochemical analysis, Irrigation effects, Ions, Nitrogen, Sodium chloride, Cation adsorption, Anion adsorption.
Identifiers: *Citrus plants, *Cations, Anions.

Leaf material may be sampled and analyzed as a means of assessing the state of the whole plant with respect to detrimental ions or nutrients. Freshly cut citrus leaf tissue (Citrus sinensis) was sliced, rinsed and incubated in standard experimental solutions containing 0.5 mM Ca sulfate and NaCl at concentrations between 0.1-100 mM. Radioactive chloride ions were used and chloride influxes into the slices were measured after 2 hrs. Cl uptake from 10mM NaCl was linear over the 2 hr., increased with mounting external Cl concentration, and was increased by increasing accompanying Na or K ion concentrations. Influxes were little affected in the dark as opposed to the light, but under anaerobic conditions, they declined steeply. The metabolic inhibitor, DNP, which uncouples respiration, inhibits influx under aerobic conditions, regardless of light. A high concentration of CMU, which prevents non-cyclic electron flow, was needed to reduce influx in the light under nitrogen. These results suggest that: (1) anion and cation influx mechanisms cannot be separated; (2) Cl influx is linked to oxidative phosphorylation, but cyclic photophosphorylation may provide an alternate energy supply and (3) there is no evidence for 2 distinct Cl transport systems. The data also explains the phenomenon of slower onset of salinity damage to citrus trees by water containing NaCl when they are spray-irrigated at night. (Casey-Arizona)
W71-05482

GEOGRAPHICAL REGULARITIES IN THE PRODUCTIVITY AND THE CIRCULATION OF CHEMICAL ELEMENTS IN THE EARTH'S MAIN VEGETATION TYPES,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut; and Akademiya Nauk SSSR, Moscow. Botanicheskii Institut.
N. I. Bazilevich, and L. Ye. Rodin.
Soviet Geography: Review and Translation, Vol 12, No 1, p 24-53, January 1971.

Descriptors: *Biomass, *Biological communities, *Vegetation, *Productivity, Climatic zones, Nutrient requirements, Distribution patterns, Environmental effects, Mapping, Tropical regions, Vegetation effects, Humus, Organic matter, Environmental gradient.
Identifiers: Chemical elements.

The mass of the biosphere is extremely small relative to the masses of the lithosphere on hydrosphere, and is composed mainly (Almost 99%) of phytomass. By virtue of constant recycling, living matter maintains a tremendous effect on geochemical processes despite its relatively small mass. The geochemical work of the phytomass may be described, dynamically, as the accumulation of matter and energy/unit time. The appropriate measurements are annual increment/unit area in the above-and underground plant communities, subdivided into structural elements. Indices of the amounts phytomass and dead organic matter give a static picture of the potential reserves of matter and energy accumulated by the plant community as of a given moment. Using a 10-point rating scale, the geographical distribution of potential productivity and of the biological circulation of the principal vegetation types is mapped and analyzed in terms of 6 parameters. From the arctic to equatorial Africa, phytomass magnitude forms a triple-crested sinusoidal distribution, with maxima occurring, from north to south, between arctic desert and broadleaf forest, between subboreal desert and subtropical forest and between subtropical and tropical rain forest except for a slight decrease at semiarid and arid steppes. Productivity is therefore not proportional to phtomass magnitude, but is associated with herbaceous woody and herbaceous communities. Annual growth and biological carring capacity and intensity increase steadily from tundra to coniferous forest to broadleaf forest and steppe, leaching maxima in the humid subtropics and tropics. In deserts, both productivity and carrying capacity are low, but the intensity of biological circulation is high. (Casey-Arizona)
W71-05483

NET AND SOLAR RADIATION RELATIONS OVER IRRIGATED FIELD CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

For primary bibliographic entry see Field 02D.
W71-05622

DIFFERING SENSITIVITY OF PHOTOSYNTHESIS TO LOW LEAF WATER POTENTIALS IN CORN AND SOYBEAN,
Illinois Univ., Urbana. Dept. of Botany.
J. S. Boyer.
Plant Physiology, Vol 46, No 3, p 236-239, March 1970. 3 fig, 26 ref. OWRR Projects A-028-ILL (3) and B-036-ILL (7).

Descriptors: *Stomata, *Photosynthesis, *Drought tolerance, *Transpiration, *Metabolism, Leaves, Drying, Corn (Field), Soybeans, Carbon dioxide, Soil-water-plant relationships, Laboratory tests, Mode of action, Moisture stress, Water balance, Environmental effects, Temperature, Permeability, Diffusion, Boundary layers, Resistance, Inhibition.
Identifiers: *Water potential.

Some evidence has accrued for advancing the thesis that plant species having the 4-carbon dicarboxylic acid photosynthetic pathway are, for biochemical or morphological reasons, more drought resistant. Corn (Zea mays) and soybeans (Glycine max) were subjected to drought and photosynthetic and transpiration rates and leaf air permeabilities were measured at various levels of water potential. Diffusive resistances to carbon dioxide entry could be calculated. In corn, photosynthetic rates were inhibited at water potentials of -3 bars and photosynthesis ceased at -16 bars. The equivalent figures for soybeans were -11 and -41 bars. As leaf water potentials dropped, photosynthesis inhibition in both species did not occur until transpiration reduction and stomatal closure also occurred. Therefore, photosynthesis inhibition seemed dependent on stomatal behavior. Since corn has a 4-carbon photosynthetic pathway while soybeans do not, such a pathway does not seem to confer greater drought tolerance. However, at any given level of water potential down to -16 bars, corn photosynthetic rates were greater than those of soybeans, so the results must be carefully interpreted. (Casey-Arizona)
W71-05707

THE EDAPHIC ADAPTATION OF SOME CLOSELY RELATED CLOVERS,
Newe Yaar Experiment Station (Israel). Div. of Forage Crops and Pasture.
J. Katznelson.
Ecologia Plantarum, Vol 4, No 2, p 211-224, 1969. 1 fig, 5 tab, 15 ref. USDA Contract A10-CR-56.

Descriptors: *Clovers, *Soil-water-plant relationships, *Statistical methods, *Soil types, *Plant growth, Ecology, Environmental effects, Lavoratory tests, Legumes, Ecotypes, Soil analysis, Soil chemical properties, Soil classifications, Soil groups, Soil moisture, Soil properties, Variability, Alluvium, Basalts, Loam, Analytical techniques, Weight, Varieties, Crop response, Model studies, Data collections.
Identifiers: *Israel, *Analysis of variance, Grumosols, Lithosols, Rendzinas.

Trifolium is one of the world's largest plant genera. A group of species are native to Israel, Jordan, Syria and Lebanon and are usually distributed in relation to edaphic conditions. Whether the presence of a species in a given soil is incidental is not known. Five Trifolium species and 1 hybrid, alexandrinum, berytheum, vavilovi, carmeli, plebeium and pilulare X subterraneum were grown together in 10 different soil types, including basalts, heavy alluvial grumosols, light rendzinas, light brown lithosols and water logged sandy loams, and their growth characteristics were compared. The differences between species and between soils in weights of the upper parts of the plants were very large and statistical analysis showed that the variability depended on soil types and plant species that did not share a common variance. Compared to shoot weight, root weight differences due to species were much more conspicuous than differences due to soil. Some drastic differences in growth oc-

curred, and analyses of variance could not fit the data to either additive or multiplicative models, although the data did fit better to multiplicative models. Soil analyses confirmed that species varied in their ability to utilize favorable edaphic conditions. (Casey-Arizona)
W71-05708

WATER BALANCE IN LEAF TISSUE,
Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
For primary bibliographic entry see Field 02D.
W71-05709

THE PARTITIONING OF RESISTANCES TO PHOTOSYNTHETIC CARBON DIOXIDE UPTAKE IN THE LEAF,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
Dov Koller.
AGC Contract AT (04-1) GEN-12. New Phytologist, Vol 69, No 4, p 971-981, October 1970. 5 fig, 1 tab, 9 ref.

Descriptors: *Resistance, *Carbon dioxide, *Photosynthesis, *Leaves, *Absorption, Theoretical analysis, Model studies, Stomata, Structure, Plant morphology, Plant physiology, Diffusivity, Epidermis, Mode of action, Transpiration, Analog models, Plant tissues, Resistance networks, Boundary layers.
Identifiers: *Water potential, *Leaf mesophyll, *Leaf anisolaterality.

The liquid phase in a leaf will tend to remain at a uniform water potential, preventing development of concentration differences in the vapor phase. By contrast, leaf tissues differ in their ability to fix carbon dioxide and in boundary layer, epidermal and pathway resistances to carbon dioxide diffusion. It follows that transpiration is not limited by any intercellular pathway resistance, but that photosynthesis is likely to be greatly affected. The various resistances to carbon dioxide may be fractionated into subcomponents and treated algebraically as electrical resistances. Taking into account resistances involving mesophyll resistances in the upper and lower chlorenchyma and resistance between the upper and lower leaf layer including leaf anisolaterality, an electrical analogue model was constructed to show the partitioning of overall resistance to photosynthetic carbon dioxide uptake in a bilateral leaf. Mesophyll component resistance is usually calculated by subtracting diffusional resistance component from total carbon dioxide uptake resistance. Calculations show that considerable error arises in the estimation of mesophyll resistance when internal diffusion and epidermal and/or mesophyll anisolaterality are neglected. Using parallel chambers and a diffusion porometer, the appropriate parameters may be measured and used to correct mesophyll resistance calculations. As the mesophyll resistance increases, component error factor resistances decrease relatively. (Casey-Arizona)
W71-05713

GROWTH OF ATRIPLEX HALIMUS L. IN SODIUM CHLORIDE SALINATED CULTURE SOLUTIONS AS AFFECTED BY THE RELATIVE HUMIDITY OF THE AIR,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
J. Gale, R. Naaman, and A. Poljakoff-Mayber.
USDA Project No A10-SWC-7. Australian Journal of Biological Sciences, Vol 23, No 5, p 947-952, October 1970. 7 fig, 10 ref.

Descriptors: *Humidity, *Salinity, *Plant growth, *Environmental effects, *Physiological ecology, Leaves, Halophytes, Xerophytes, Osmotic pressure, Sodium chloride, Mode of action, Laboratory tests, Vapor pressure, Turgidity, Growth chambers, Arid climates, Humid climates, Climatology.
Identifiers: *Relative humidity, *Seedlings, *Water potential.

It has been shown that A. halimus plants in the laboratory demonstrate varying patterns of growth and physiological behavior in response to salinity differences, just as plants in the wild show varying patterns with season. In attempting to establish and interdependence between climatic and salinity effects, one climatic parameter--relative humidity (RH)--was examined. Two groups of seedlings were grown under identical climatic conditions in growth chambers, except that 1 group was exposed to about 65% RH and the other to about 27% RH. Each group was subdivided according to salinity media osmotic pressures, ranging from 0 to -20 atm. The plants showed very apparent differences in growth under the 2 conditions of humidity. (1) Dry-air plants showed maximum growth curves at -5 atm while humid-air plants showed a steady growth decline from a 0 atm optimum. (2) Plants grown with no NaCl (0 atm) in the humid chamber had a low fresh weight/dry weight ratio which showed an optimum at -3 atm, while the optimum for low humidity occurred at-10 atm. (3) Dry-air plants achieved less turgor and height at 0 atm, but equaled humid-air plants grown at the same salinity when osmotic potentials were -5 atm or less. (4) NaCl reduction of leaf weight/stem weight was greater in humid-grown plants. It is possible that microquantities of NaCl present as impurities may have been essential for growth even in high-humidity plants. The results suggest possible explanations for plant distribution, such as the absence of halophytes in the arid non-saline areas of the Mediterranean region. (Casey - Arizona)
W71-05714

THE INHIBITION OF FLOWERING BY WATER STRESS,
Adelaide Univ. (Australia). Waite Agricultural Research Inst.
D. Aspinall, and I. Husain.
Supported by the U.N. Arid Zone Research Program and the Australian Barley Improvement Trust Fund. Australian Journal of Biological Sciences, Vol 23, No 5, p 925-936, October 1970. 6 fig, 3 tab, 22 ref.

Descriptors: *Moisture stress, *Osmotic pressure, *Flowering, *Inhibition, *Leaves, Laboratory tests, Translocation, Mode of action, Plant physiology, Diurnal, Turgidity, Photoactivation, Plant growth, Water balance, Water requirements, Water utilization, Moisture deficit, Light, Photoperiodism.
Identifiers: *Water potential, *Induction, *Defoliation, *Apical morphogenesis, *Osmotic stress, Cotyledons, Psychrometers.

The inhibition of apical growth by water stress may be mediated through an inhibition of photoperiodically controlled floral induction. This may best be studied in single-cycle plants, such as Lolium temulentum, Pharbitis nil and Xanthium strumarium, where that inductive treatment can be clearly separated from floral development. When L. temulentum was subjected to osmotic stress during it's 16-hr. inductive photoperiod, osmotic stresses of -18 to -24 atm reflected by relative leaf turgidities of 75-78%, resulted in an inhibition of flowering. Osmotic stresses during the 16-hr. inductive dark period of P. nil decreased flowering at -2 atm and eliminated it at -6 atm. Creating stress by withholding water before the 16-hr. dark inductive period of X. strumarium had no effect if it was terminated before the inductive period, but eliminated flowering if it was continued through the inductive period--unless the stress was extremely severe. Indirect evidence suggests that floral stimulus is translocated from an induced lea, and that this process is disrupted by water stress. This was supported by flowering inhibition in plants defoliated during the inductive period. By contrast, mildly stressed plants that were not defoliated during the inductive period formed several flowers, indicating some stability of the floral stimulus during stress periods. (Casey-Arizona)
W71-05715

2J. Erosion and Sedimentation

A CONSIDERATION OF POLLEN, DIATOMS AND OTHER REMAINS IN POSTGLACIAL SEDIMENTS,
Iowa State Univ., Dept. of Botany and Plant Pathology; and Iowa Lakeside Lab., Milford.
John D. Dodd, Ruth M. Webster, Gary Collins, and Larry Wehr.
Iowa Academy of Science Proceedings, Vol 75, p 197-209, 1968. 13 p, 5 fig, 2 tab, 15 ref. OWRR Project A-008-IA (2).

Descriptors: *Palynology, *Sediments, *Diatoms, *Pollen, *Iowa, Deposition (Sediments), Stratification, Lakes, Sedimentary structures, Diatomaceous earth, Sedimentation.
Identifiers: *Postglacial sediments, *Lake Okoboji (Iowa).

Pollen and diatoms in post-glacial sediments from a shallow bay of Lake Okoboji, Iowa, is considered. The presence of other microfossils is noted with emphasis on those of Cretaceous origin. Samples were dried at 100 deg C., weighed, and then separated into two portions, one for inorganic C determination and one for total organic matter determination. Samples were treated with trichloroacetic acid and weight loss was determined from liberation of CO2. From this the percentage of inorganic C was calculated. Organic matter determination was done by igniting samples in a 900-1000 deg muffle furnace for six hours per sample. Organic matter percentage was then calculated as the percentage of weight lost minus the inorganic C percentage. At the 27-foot level there is a well-defined population of diatoms which includes 22 genera and 66 taxa. The first appearance of diatoms may be more indicative of the beginnings of biological activity in a post-glacial lake than the presence of pollen which might be blown in from some distance. The pollen counts, from the top to the 27-foot level, indicate that no drastic change in the surrounding land vegetation occurred. (Woodard-USGS)
W71-05340

ORIGIN OF CLAY MINERALS IN A MID-ATLANTIC RIDGE SEDIMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
R. A. Copeland, F. A. Frey, and D. R. Wones.
Earth and Planetary Science Letters, Vol 10, No 2, p 186-192, January 1971. 7 p, 3 fig, 2 tab, 25 ref. ONR Contract Nonr 1841 (74).

Descriptors: *Clay minerals, *Clays, *Bottom sediments, *Atlantic Ocean, *Provenance, Mineralogy, Sampling, Trace elements, Chemical analysis.
Identifiers: Rare earth elements.

The coarse and fine-grained mineral fractions of a Mid-Atlantic Ridge sediment (22 deg N) have been separated and analyzed for Fe and rare-earth elements (REE). Despite changes in Fe abundance, all the chlorites have REE distributions consistent with a derivation from ridge greenstones. The REE distribution of the fine-grained montmorillonite is similar to that of shales, yet differs markedly from that of a coarse locally derived iron-rich montmorillonite. A continental origin for the fine-grained montmorillonite is implied. (Knapp-USGS)
W71-05347

REMOVAL OF A SPHERICAL PARTICLE FROM A FLAT BED,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
Charng Ning Chen.
Georgia Institute of Technology Environmental Resources Center Report ERC-0770, November 1970. 96 p, 24 fig, 11 tab, 33 ref.

Descriptors: *Sediment transport, *Scour, *Hydraulic models, *Tractive forces, Flow, Fluid friction, Hydrostatic pressure, Hydrodynamics, Hydraulic similitude, Statistical methods, Laboratory tests, Bed load.
Identifiers: *Hydrodynamic lift, *Sediment entrainment.

The mechanics of the process by which a sediment particle is removed from a stream bed was investigated by study of an idealized model, consisting of a one-inch diameter sphere protruding through a flat plate. By means of this model, the statistical variables of the angle of repose, the protrusion condition, and the approach velocity distribution became controllable at deterministic values. Initial motion of the particle is a fluctuating phenomenon which must be described in probabilistic germs because the fluid-dynamic force is fluctuating in nature. The transition from a stationary state to the removal of the spherical particle was found to be gradual rather than instantaneous. The transition is characterized by the random rocking motion of the sphere. The fluid-dynamic moments and forces were determined experimentally in air flow with both uniform and nonuniform approach velocity profiles. The ratio of the coefficient of lift to drag decreased from 1.6 to 0.4 as the ratio of the protrusion height to the sphere diameter increased from 25 percent to 100 percent. (Knapp-USGS)
W71-05350

FIELD TESTING OF THE IAEA PORTABLE RADIOISOTOPE SEDIMENT-CONCENTRATION GAUGE,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 07B.
W71-05352

A TROPICAL EXAMPLE OF TOPSOIL ENRICHMENT BY FLOOD SILT,
South Pacific Regional Coll. of Tropical Agriculture, Alafua (Western Samoa).
S. G. Reynolds.
Journal of Hydrology (New Zealand), Vol 9, No 1, p 32-35, 1970. 4 p, 1 tab, 6 ref.

Descriptors: *Floods, *Silts, *Organic matter, *Deposition (Sediments), *Fertilization, Silting, Sediments, Soil-water-plant relationships.
Identifiers: *New Zealand.

The sediments deposited during a flash flood estimated to have had a peak discharge of the order of 2000 cusecs are demonstrated to have considerably enriched the topsoil of several acres of productive valley alluvium. The probability that this is a recurring rejuvenation process is discussed. As the flood subsided a thin layer of fresh river silt was deposited over much of the valley bottom. In small local depressions this was 4-5 cm deep. As this layer dried out it developed the polygonal cracks typical of material with a high clay-silt content. The silt has a higher level of organic carbon and total nitrogen than the soil. In fact, some of the sediments had a thin black skin of organic matter on drying out. The individual exchangeable cations and cation-exchange are twice as high in the flood sediment as in the topsoil. These richer sediments were deposited over much of the area occupied by various vegetable test plots. Although some damage was caused by the flood, river sedimentation was in this case beneficial, because the rich sediments were deposited in thin layers which could easily be incorporated into the topsoil by plowing. (Knapp-USGS)
W71-05358

FAULKS V BOROUGH OF ALLENHURST (INSTALLATION OF SEWAGE TREATMENT PLANT ON PUBLIC ROAD EASEMENT).
For primary bibliographic entry see Field 06E.
W71-05403

TWELFTH CONFERENCE ON GREAT LAKES RESEARCH,
Michigan Univ., Ann Arbor. Great Lakes Research Div.; and Bureau of Commercial Fisheries, Ann Arbor. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 02H.
W71-05561

NEARSHORE SEDIMENT SURVEY OF WESTERN LAKE ONTARIO, METHODS AND PRELIMINARY RESULTS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
N. A. Rukavina.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 317-324, 1969. 8 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Bottom sediments, *Lake Ontario, *Surveys, Sampling, Profiles, Stratigraphy, Sounding, Cores, Provenance, Data collections, Erosion, Sedimentation, Currents (Water), Sediment transport, Great Lakes.
Identifiers: Niagara River.

Surface sediment samples, echo sounder profiles, and bottom observations by divers and with underwater television are used to map the sediments and bottom morphology of nearshore Lake Ontario (depth 0-20 m). In 1968 mapping was completed in western end of the Lake from Niagara on the south shore to Whitby on the north shore. Six bottom types are recognized and delineated: (1) bedrock 23%, (2) glacial drift 39%, and the recent sediments (3) gravel and pebbly sand 9%, (4) sand 12%, (5) silt-sand 10%, and (6) silt-clay 7%. Recent sediments occur: (1) on the south shore from Niagara to Jordan, (2) on the west shore opposite the Burlington Bar, and (3) on the north shore opposite Metropolitan Toronto. The deposits at Toronto and Niagara result from local erosion of shore bluffs; westward-moving longshore currents supply the sediment accumulating offshore from the Burlington Bar. (See also W71-05561) (Knapp-USGS)
W71-05562

ORGANIC MATTER IN THE SEDIMENTS OF LAKES ONTARIO AND ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
A. L. W. Kemp.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 237-249, 1969. 13 p, 4 fig, 2 tab, 24 ref.

Descriptors: *Bottom sediments, *Organic matter, *Lake Erie, *Lake Ontario, Cores, Sampling, Silts, Clays, Mud, Humic acids, Fulvic acids, Sedimentation, Paleoclimatology, Paleohydrology, Lakes, Sediment-water interfaces, Great Lakes.

Organic carbon and carbonate carbon were determined in six piston cores from Lake Ontario and four piston cores from Lake Erie. The changes in organic carbon with depth of burial are related to sediment type and Eh. Nitrogen, bitumens, humic acids, fulvic acids and kerogen were measured in three surface sediment samples from each Lake. The basin sediments of Lake Ontario consisted of black laminated grey silty clay muds overlying grey glacial clay, with mud thicknesses ranging from 4.6 to 13.8 m in the cores. Organic carbon content decreased 50% in the top 20 cm of sediment and then gradually decreased to 1% at the glacial clay contact. A complex organic carbon horizon was found two thirds of the way down the post glacial mud cloumn at each core station and was attributed to a warmer climate between 4000 and 7500 years BP. Bitumens accounted for 3 to 6% of the organic matter, humic and fulvic acids for 19 to 27% and kerogen for 35 to 49% in the surface centimeter of sediment, in the main basins of the two Lakes. (See also W71-05561) (Knapp-USGS)
W71-05565

ANALYSIS OF SEDIMENT CORES FROM BIG MUSCAMOOT BAY AND GOOSE BAY IN THE ST. CLAIR RIVER DELTA,
Wayne State Univ., Detroit, Mich.
Hugo Mandelbaum.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 271-299, 1969. 29 p, 12 fig, 12 tab, 7 ref.

Descriptors: *Bottom sediments, *Lakes, *Michigan, *Deltas, *Particle size, Variability, Cores, Statistical methods, Provenance, Sedimentation, Sediment transport, Sampling, Data processing, Data collections, Statistics, Great Lakes.
Identifiers: *Lake St. Clair, Muscamoot Bay.

Grain size analysis from sediment cores taken in the Big Muscamoot Bay and Goose Bay of the St. Clair River Delta show a great variability in the sediments. A variability index was defined and core parameters were constructed. The variability index has a log-normal distribution and is directly correlated to mean grain size of the sediment. Extent of the sedimentation area increases both mean grain size and variability. Higher order trend surfaces of the sediment parameters reveal strong trends in the direction of the bay axes but inconsistent trends across the bays. The amount of very coarse grains is large in the Outer Muscamoot Bay, more than 1.5% by weight. The investigated data suggest stable conditions since the beginning of deltaic sedimentation 12,000 years ago. (See also W71-05561) (Knapp-USGS)
W71-05566

HIGH RESOLUTION REFLECTION SEISMIC SURVEY IN WESTERN LAKE ERIE,
Geological Survey of Canada, Ottawa (Ontario), Geological Survey of Canada, Burlington (Ontario); and Ohio State Geological Survey, Sandusky.
For primary bibliographic entry see Field 02H.
W71-05567

CHARACTERISTICS OF LAKE MICHIGAN BOTTOM PROFILES AND SEDIMENTS FROM LAKESIDE, MICHIGAN TO GARY, INDIANA,
Army Coastal Engineering Research Center, Washington, D.C.
Eugene F. Hawley, and Charles W. Judge.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 198-209, 1969. 12 p, 6 fig, 21 ref.

Descriptors: *Bottom sediments, *Lake Michigan, *Indiana, *Sand bars, Beaches, Sands, Water circulation, Distribution patterns, Profiles, Currents (Water), Sedimentation, Provenance, Mineralogy, Particle size, Particle shape, Stratigraphy, Erosion, Scour, Beach erosion, Great Lakes.
Identifiers: Bottom profiles (Lake Michigan).

In order to evaluate the effects of lake levels and other factors on littoral processes the U.S. Army Corps of Engineers' Coastal Engineering Research Center is studying the southeastern shore of Lake Michigan from Lakeside, Michigan to Gary, Indiana, a distance of 34 mi. During 1966 and 1967 hydrographic profiles and approximately 500 sand samples were taken and analyzed. Profiles in the study area generally exhibit one or two offshore bars. Similar bars along this section of the coast have been previously described as stable; however, this study illustrates shifting from one year to the next. The profiles also indicate that accretion is predominant in the study area. Beach and bottom sediments in the study area are generally subround

quartz sand of various brownish tones with approximately 3n5% metamorphic (resistate) minerals; however, some coarse sediments contain nearly 100% rock fragments. Areally, sediment distribution trends follow the coastline and bathymetry and are stable from one year to the next. In general, medium sand predominates above waterline; the coarsest material occurs at the waterline. Offshore, medium and fine sands occur; fine sand is predominant. Littoral drift is toward the WSW. (See also W71-05561) (Knapp-USGS)
W71-05568

SEDIMENTS AND GEOLOGY OF BOIS BRULE RIVER, WESTERN LAKE SUPERIOR,
Wisconsin State Univ., Superior. Dept. of Geology.
Albert B. Dickas, and Paul C. Tychsen.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 161-169, 1969. 9 p, 6 fig, 10 ref. OWRR Project A-023-WIS (6).

Descriptors: *Bottom sediments, *Lake Superior, *Provenance, *Wisconsin, Bed load, Sediment transport, Geology, Mineralogy, Mapping, Sands, Silts, Clays, Glacial drift, Sedimentation, Streamflow, Sediment load, Great Lakes.
Identifiers: *Bois Brule River (Wis).

A sedimentary analysis was made of the bed load of the Bois Brule River, Douglas County, Wisconsin to study the statistical characteristics of the clastic material and the Holocene sedimentation history of the Wisconsin shoreline of Lake Superior. The average mean size distribution of the clastic load, based on the phi scale, is 10% granules, 74% sand, 13% silt and 3% clay. To determine whether this dominantly sand-sized sediment was derived from basement rock or glacial debris, stream gravels larger than granule size were petrographically analyzed and compared to surficial and basement rock maps. The glacial cover is the prime source of the clastic material of the river load; mapping shows that outwash sands and reworked glacial drift predominate over much of the drainage area. A secondary source is outcropping Keweenawan (Cambrian) sandstones. The river load is deposited in Lake Superior out to a distance of 1/2 - 1 mile from the shoreline. (See also W71-05561) (Knapp-USGS)
W71-05569

GEOCHEMICAL CHARACTERISTICS OF LAKES MICHIGAN AND SUPERIOR SEDIMENTS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
Edward Callender.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 124-160, 1969. 37 p, 6 fig, 10 tab, 28 ref, 3 append. NSF Grants GA 1337 and GA 4507. FWQA Grant WP-00311.

Descriptors: *Bottom sediments, *Lake Michigan, *Lake Superior, *Water chemistry, *Sediment-water interfaces, Connate water, Mineralogy, Equilibrium, Ion exchange, Ion transport, Diagenesis, Geochemistry, Oxidation-reduction potential, Iron, Calcium, Magnesium, Sodium, Potassium, Manganese, Chlorides, Sulfates, Silica, Great Lakes.
Identifiers: *Sedimentary geochemistry.

More than 140 sediment samples from Lakes Michigan and Superior were analyzed for calcium, magnesium, iron, manganese, inorganic carbon, organic carbon, and total nitrogen content. Interstitial water from these same samples was analyzed for dissolved calcium, magnesium, sodium, potassium, iron, manganese, chloride, sulfate, and silica content. Most of the sedimentary calcium and magnesium is combined in the carbonate minerals calcite and dolomite. The remainder, especially magnesium, is associated with clay minerals. The instability of sedimentary carbonate minerals after burial is reflected in the significant increase of interstitial calcium and magnesium over lake water concentrations. Lake Michigan interstitial water is saturated with respect to calcite and dolomite while fluid from Lake Superior sediment approaches saturation with calcite but is undersaturated with respect to dolomite. Interstitial water from all lake sediments is in equilibrium with kaolinite and approaches saturation with respect to montmorillonite, chlorite, and amorphous silica. Essentially all sedimentary manganese originates in authigenic hydrated oxides. Sedimentary iron does not vary appreciably with depth in the sediment, while manganese increases significantly near the sediment-water interface. (See also W71-05561) (Knapp-USGS)
W71-05570

DEPOSITIONAL PROCESSES AND PRODUCTS IN THE DELTAIC ENVIRONMENT,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 02L.
W71-05572

STRATIGRAPHY AND HISTORY OF THE HOLOCENE SEDIMENTS IN THE SABINE-HIGH ISLAND AREA, GULF OF MEXICO,
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
For primary bibliographic entry see Field 02L.
W71-05573

THE MISSISSIPPI DELTA COMPLEX,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 02L.
W71-05574

HOLOCENE GUADALUPE DELTA OF TEXAS GULF COAST,
West Virginia Univ., Morgantown, and Campbell Coll. Buies Creek, N.C., and Esso Standard Libya, Inc., Tripoli.
For primary bibliographic entry see Field 02L.
W71-05575

THE GOLDSBORO RIDGE, AN ENIGMA,
North Carolina State Univ., Raleigh. Dept. of Soil Science; and North Carolina Univ., Chapel Hill. Dept. of Geology.
R. B. Daniels, E. E. Gamble, and W. H. Wheeler.
Southeastern Geology, Vol 12, No 3, p 151-158, January 1971. 8 p, 3 fig, 2 ref.

Descriptors: *Sedimentary structures, *Sandbars, *Terraces (Geological), *North Carolina, *Coastal plains, Sands, Sedimentation, Erosion, Stratigraphy, Beaches, Berms, Geomorphology, Surfaces, Water levels.
Identifiers: *Goldsboro ridge (NC).

The Goldsboro ridge is a sand body 25 feet high that rises above the Sunderland surface near Goldsboro, North Carolina. It consists of unfossiliferous sands with a few intercalated clay beds. The ridge is neither an erosional outlier nor an eolian feature. It is a depositional ridge, probably of marine origin. The relationships among the height and orientation of the ridge, the elevation of the toe of the nearby Kenly scarp, the location of a distinctive slate knoll immediately northwest of the ridge, and the position and orientation of the Neuse and Little Rivers are all compatible with a marine origin. The Goldsboro ridge and the Kenly scarp are the major evidences of a former post-Miocene sea stand above 95 feet (Surry scarp). (Knapp-USGS)
W71-05578

HYDROLOGIC EFFECTS OF QUATERNARY SEDIMENTS ABOVE THE MARINE TERRACES IN THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Tifton, Ga. Southeast Watershed Research Center.
Loris E. Asmussen.
Southeastern Geology, Vol 12, No 3, p 189-201, January 1971. 13 p, 7 fig, 15 ref.

Descriptors: *Aquifers, *Dunes, *Alluvium, *Georgia, *Coastal plains, Sedimentation, Stratigraphy, Geomorphology, Quaternary period, Permeability, Aeolian soils, Sinks, Karst.
Identifiers: Coastal plain sedimentation.

Quaternary and Recent aeolian and fluvial sands have a characteristic distribution pattern on watersheds in the Coastal Plain of Georgia. The streams lie on the western side of south-draining valleys, and the maximum aeolian and fluvial sediment thickness (sand dunes) is attained east of the stream and on the west-facing valley flank. These sediments form a highly permeable veneer over the older marine formations. They vary in thickness throughout the watershed with the maximum being 20 to 25 feet, and act as a shallow phreatic aquifer, making groundwater available to deep recharge, return flow to streams, and evapotranspiration. The aeolian and fluvial sediment distribution was controlled by the source effect on the stream runoff, pond and pit site location, drainage systems, soil development, watershed infiltration rates, and stream location. (Knapp-USGS)
W71-05580

SEDIMENT BUDGETS ON A COMPARTMENTED LOW-TO-MODERATE ENERGY COAST IN NORTHWEST FLORIDA,
Florida State Univ., Tallahassee.
F. W. Stapor.
Marine Geology, Vol 10, No 2, P M1-M7, February 1971. 7 p, 3 fig, 4 ref.

Descriptors: *Sediment transport, *Coasts, *Littoral drift, *Surf, Barriers, Sand bars, Bottom sediments, Waves (Water), Currents (Water), Dunes, Sands, Islands.
Identifiers: *Sediment budgets.

Sediment budgets for portions of the Franklin and Gulf County, Florida, coast were determined through comparison of old U.S. Hydrographic Office smooth sheets. Rate of erosion and deposition and minimum distances of transport were computed. This coast is divided into at least six individual compartments (or longshore drift cells) which probably experience minimal communication; in each instance erosion and deposition are nearly balanced. This is a result of the low-to-moderate wave energy and the offshore bathymetry of the region. (Knapp-USGS)
W71-05584

MEASUREMENTS OF INCIPIENT MOTION OF SEDIMENT PARTICLES IN THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-05585

A COMPUTER SIMULATION MODEL OF SEDIMENTATION IN A SALT WEDGE ESTUARY,
Sheffield Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 02L.
W71-05586

DIFFUSION COEFFICIENT OF SILICA IN SEAWATER,
Brussels Univ. (Belgium). Industrial Chemistry Lab.; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02K.
W71-05595

ARAGONITE INORGANIC PRECIPITATION IN A FRESHWATER LAKE,
Heidelberg Univ. (West Germany). Sediment Research Lab.
German Muller.
Nature Physical Science, Vol 229, No 1, p 18, January 4, 1971. 1 p, 2 ref.

Descriptors: *Sediments, *Lakes, *Lake soils, *Calcite, Crystallization, Magnesium, Calcium, Inorganic compounds, Phytoplankton, Clays, Alluvium, Chemical precipitation, Water chemistry, Electrolytes.
Identifiers: *Lake Balaton (Hungary), *Aragonite precipitation, Freshwater lake.

In Lake Balaton, Hungary, large quantities of fine grained, high-magnesian calcite are precipitated during the warmer seasons by a strong growth of phytoplankton. The formation of high-magnesian calcite can be related to the high Mg/Ca ratio of the lake water which varies locally between about one and three. The elecyrolyte concentration of the lake water is less than 500 mg/liter. The high Mg/Ca ratio of the lake water influences both the crystallization of aragonite and high-magnesian calcite as is the case under marine and some hypersaline conditions. (Woodard-USGS)
W71-05597

BOTTOM CURRENTS IN WILMINGTON SUBMARINE CANYON,
Governors State Univ., Park Forest, Ill.; University Coll. of Swansea (Wales). Dept. of Geology; and Smithsonian Institution, Washington, D.C. Sedimentology Div.
For primary bibliographic entry see Field 02L.
W71-05600

ION EXCHANGE AND RADIOCARBON DATING OF ALLUVIAL SEDIMENTS FROM THE LOWER RIO COPIAPO, CHILE,
Instituto de Investigaciones Geologicas, Santiago (Chile); Queen's Univ., Kingston (Ontario). Dept. of Geologic Sciences; and New Mexico Highlands Univ., Las Vegas. Dept. of Chemistry.
Cedric Mortimer, A. H. Clark, and J. A. Schufle.
Nature Physical Science, Vol 229, No 2, p 54-55, January 11, 1971. 2 p, 2 fig, 6 ref.

Descriptors: *Dating, *Geologic time, *Ion exchange, Alluvial channels, Methodology, Test procedures, Sampling, Sodium, Potassium, Evaluation, Radioactive dating, Carbon radiosotopes, Instrumentation.
Identifiers: *Alluvial sediments, *Lower Rio Copiapo (Chile).

A correlation between ion exchange and radiocarbon ages for terrace sediments is described. The ion exchange method seems to be at its best in environments which are geomorphologically well defined. In the Lower Rio Copiapo, Chile, channel samples of alluvial sediment were collected for ion exchange dating from the bluff of the principal terrace on the left bank. After screening, the minus-200 mesh sediment fractions were analyzed. Cations were extracted by leaching with a 1 molar solution of ammonium acetate in a ratio of 1:10 with the soil by weight. The resulting mush was allowed to stand for 24 h before being filtered and analyzed for Na and K by flame photometer. Both Na and K are seen to attain peak concentrations at a depth of only 6 cm. The time taken for these cations to attain concentration peaks at a depth of 6 cm were calculated. An approximate age of 1,000 yr for the Rio Copiapo principal terrace is in agreement with the radiocarbon dating. (Woodard-USGS)
W71-05601

PRECIPITATION OF VATERITE IN LAKE WATER,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 02K.
W71-05603

THE SEDIMENTARY FRAMEWORK OF MORETON BAY, QUEENSLAND,
Sydney Univ. (Australia). Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02L.
W71-05615

PLEISTOCENE STRATIGRAPHY OF THE SALISBURY AREA, MARYLAND, AND ITS RELATIONSHIP TO THE LOWER EASTERN SHORE: A SUBSURFACE APPROACH,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 02F.
W71-05619

HEAVY MINERALS IN BEACH AND STREAM SEDIMENTS AS INDICATORS OF SHORE PROCESSES BETWEEN MONTEREY AND LOS ANGELES, CALIFORNIA,
Army Coastal Engineering Research Center, Washington, D.C.
Charles W. Judge.
CERC Technical Memorandum No 33, Nov 70. 52 p, 46 ref.

Descriptors: Shore protection, *Littoral drift, *Sands, *Sediment transport, California.
Identifiers: Heavy minerals, Epidote, Augite, Hornblende, Garnet, Zircon, *Littoral transport, *Littoral barrier, Sand analysis, Point Conception (Calif).

A study of heavy minerals on the California Coast was made at CERC as an adjunct to the Radioisotopic Sand Tracer (RIST) and the Littoral Environmental Observation (LEO) programs. Beach samples taken during various times of the year were supplemented by samples from offshore and the rivers. Heavy minerals in the 63-125 micron fraction of the samples were identified by optical techniques. Five provinces were identified: (1) a northern Hornblende province from north of Monterey Bay to Piedras Blancas Point; (2) a northern Augite Province from Piedras Blancas to Avila Beach; (3) an Epidote province from Avila Beach to Ventura; (4) a southern Augite Province from Ventura to Palos Verdes Point; and (5) a southern Hornblende Province from Point Fermin south. The ratios of the less stable augite and hornblende to the more stable garnet and zircon indicated a southward littoral transport north of Point Conception. Increase in grain sizes and in augite and hornblende content south of the input from the Ventura and Santa Clara Rivers indicated a southward net littoral transport there. Similar trends could not be found between Point Conception and Ventura. Because of possible multiple sources for augite and reversals in littoral transport, heavy minerals are not definitive indicators of littoral drift from Point Conception to Ventura. However, considering other evidence from radioisotopic tracer surveys, historical surveys and dredging projects, it is reasonable to conclude that, although Point Conception-Point Arguello may act as a partial barrier, some sand moves south and east around them. (CERC)
W71-05655

TRACING SAND MOVEMENT IN THE LITTORAL ZONE: PROGRESS IN THE RADIOISOTOPIC SAND TRACER (RIST) STUDY - JULY 1968-FEBRUARY 1969,
Army Coastal Engineering Research Center, Washington, D.C.
David B. Duane.
CERC Miscellaneous Paper 4-70, Aug 70. 52 p, 28 ref.

Descriptors: *Sediment transport, *Sediment distribution, *Beaches, Data processing, *Oceanography, Instrumentation.
Identifiers: Dynamic oceanography, Littoral processes, *Sediment tracers, Sediment analyses, *Hydrographic surveys, Radioisotopes, Xenon-133, Gold 198-199, Radiation detector, Cesium iodide crystals, Headlans, California.

Tagging procedures, instrumentation, field surveys and data handling techniques have been developed by the radioisotopic sand tracing study for the collection and analysis of over 12,000 bits of information per hour over a survey track of about 18,000 feet. Data obtained can be considered as nearly synoptic observations of sediment transport in a single environmental zone or in adjacent beach, surf and offshore zones. Experiments at Surf, Point Conception, Point Mugu, and Oceanside, California, used sand tagged with isotopes of xenon or gold. Data from studies in beach areas unmodified by littoral barriers indicate that the alongshore velocity of sediment transport differs from zone to zone. Transport seaward of peaking, breaking waves is less than transport on the beach face which is less than transport in the plunge and surf zone. Zone dimensions change with waves and tides. Tracing surveys confined to the foreshore of offshore zones produce data only partly indicative of transport in the zone of immediate concern to coastal engineers. Studies conducted at the site of shore structures indicate the RIST system can provide data useful in understanding the effect of such structures on sediment transport. (CERC)
W71-05657

RAPLOT II - COMPUTER PROGRAM FOR DATA PROCESSING AND GRAPHICAL DISPLAY FOR RADIOISOTOPIC SAND TRACER STUDY,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-05658

EXPERIMENTAL DUNES OF THE TEXAS COAST,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08A.
W71-05660

GEOMORPHOLOGY AND SEDIMENTS OF THE NEARSHORE CONTINENTAL SHELF MIAMI TO PALM BEACH, FLORIDA,
Army Coastal Engineering Research Center, Washington, D.C.
David B. Duane, and Edward P. Meisburger.
Available from NTIS as AD-699 339, $3.00 in paper copy, $0.95 in microfiche. Technical Memorandum No 29, Nov 1969, various paging.
Identifiers: *Beaches, Protection, *Continental shelves, Deposits, Sand, Ocean bottom sampling, Sedimentation, Degradation, Seismic waves, Reflection, Seacoast, Echo ranging, Surveying, Florida, *Shore protection, Palm Beach (Fla), Miami (Fla), Boca Ration (Fla), Geomorphology.

The Continental Shelf off SE Florida between Palm Beach and Miami was surveyed to locate and evaluate sand deposits usable for artificial beach nourishment. Survey data covered 141 square miles of that part of the Continental Shelf between 15 and 100-foot depths, and consisted of seismic reflection profiles and sediment cores from the sea floor. As beach nourishment, sand-sized sediments from the shelf off SE Florida are of marginal quality.
W71-05674

2K. Chemical Processes

POLYWATER AND POLYPOLLUTANTS,
Birkbeck Coll., London (England). Dept. of Crystallography.
For primary bibliographic entry see Field 01B.
W71-05346

GEOCHEMICAL HYDROLOGY OF THE GROUNDWATER IN BATON ROUGE, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
Rashid A. Khan.
Ph. D. Dissertation, Louisiana State University and Agricultural and Mechanical College, January 1971. 104 p, 17 fig, 13 tab, 47 ref, 3 append. OWRR Project A-010-LA (1).

Descriptors: *Water chemistry, *Hydrogeology, *Louisiana, *Aquifer characteristics, Groundwater movement, Aquifers, Saline water, Ion transport, Ion exchange, Chlorides, Bicarbonates, Carbonates, Sulfates, Diagenesis, Membrane processes, Magnesium, Sodium, Potassium, Geochemistry.
Identifiers: *Baton Rouge (La).

Chemical character of the groundwater in the Baton Rouge area of Louisiana is a function of several physicochemical processes, including ion exchange, filtration due to clay compaction, mineral solubility, and mixing of the waters. Chloride water is a mixture of diagenetically altered sea or estuarine water with fresh water. The chloride waters originated from the dilution of original trapped salty water by fresh waters. Sodium bicarbonate water is the result of ion exchange and membrane filtration. Membrane filtration is most active in the area of maximum land surface subsidence. The Ca and Mg bicarbonate waters formed at shallower depths, are principally due to solution of carbonate minerals. Regression analyses suggest that ionic character of the groundwater is not related to the area of supposed recharge, but to the depth of occurrence, the Mississippi River, and extensive withdrawal of water in the industrial area. Hydrochemical facies indicate that Baton Rouge fault acts as a hydrologic barrier. (Knapp-USGS)
W71-05348

SOME METHODS OF APPRAISING THE INTENSITY OF WATER MIGRATION OF CHEMICAL ELEMENTS, (IN RUSSIAN),
Uralskoe Territorialskoe Geologicheskoe Upravlenie (USSR).
G. A. Vostroknutov.
Doklady Akademii nauk BSSR, Vol 14, No 1, p 53-56, 1970.

Descriptors: *Chemicals, *Water properties, *Migration, Precipitation (Atmospheric), Runoff, Oxidation, Weathering, Mathematical studies.
Identifiers: *Hydrochemical balance, Sulfur oxidation, Epigenetic process, Expotentiality law.

Water migration of chemical elements may be subdivided into three mutually interlaced groups: migration from rocks, soils, atmosphere, and biosphere into waters; migration in still and flowing waters; migration from water into water basins and adjacent geospheres. The predominant mode of element migration is established on the basis of hydrochemical balance determined within the limits of a given area and time segment. Studies of the hydrochemical balance in the Ural region revealed a strong influence of oxidation of sulfides on the weathering and migration of ore-containing elements. The results were obtained by integration of several parameters including precipitation, runoff, and concentration of elements. (Wilde-Wisconsin)
W71-05396

DIFFUSIVITY OF OXYGEN IN AQUEOUS ELECTROLYTE SOLUTIONS,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W71-05454

GEOCHEMISTRY OF LAKE MICHIGAN MANGANESE NODULES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 02H.
W71-05563

GEOCHEMICAL CHARACTERISTICS OF LAKES MICHIGAN AND SUPERIOR SEDIMENTS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 02J.
W71-05570

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
John Carroll Univ., Cleveland, Ohio; and Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05A.
W71-05571

A DISCUSSION OF THE CHEMICAL CHARACTER OF WATER MIXTURES,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W71-05582

THE DETERMINATION OF LOW LEVELS OF COBALT-60 IN ENVIRONMENTAL WATERS BY LIQUID SCINTILLATION COUNTING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-05590

DIFFUSION COEFFICIENT OF SILICA IN SEA-WATER,
Brussels Univ. (Belgium). Industrial Chemistry Lab.; and Scripps Institution of Oceanography, La Jolla, Calif.
Roland Wollast, and Robert M. Garrels.
Nature Physical Science, Vol 229, No 3, p 94, January 18, 1971. 1 p, 4 ref.

Descriptors: *Diffusion, *Silica, *Sea water, Membrane processes, Laboratory tests, Methodology, Test procedures, Sediments, Oceans, Salinity, Water chemistry, Diagenesis, Sediment-water interfaces.
Identifiers: *Silica diffusion coefficient.

The diffusion coefficient of dissolved monomeric silica in seawater of 36.1% salinity has been determined at 25 deg C by the diaphragm cell method. Silica was permitted to diffuse across a porous membrane from stirred seawater of higher silica concentration into otherwise identical seawater of lower silica concentration. Two separate seawater samples were used and five individual determinations of the diffusion coefficients for silica were made on each sample. There was no significant difference between the average diffusion coefficient in the first run and that for the second run. The average deviation for the ten determinations was 2%. Recent marine sediments probably have a directional diffusional porosity of about 30%. Therefore the apparent diffusion coefficient for such systems should be about 0.3 times the value of the silica diffusion coefficient for pure seawater. (Woodard-USGS)
W71-05595

ARAGONITE INORGANIC PRECIPITATION IN A FRESHWATER LAKE,
Heidelberg Univ. (West Germany). Sediment Research Lab.
For primary bibliographic entry see Field 02J.
W71-05597

ANOMALOUS WATER NOT POLYWATER,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
For primary bibliographic entry see Field 01B.
W71-05599

ION EXCHANGE AND RADIOCARBON DATING OF ALLUVIAL SEDIMENTS FROM THE LOWER RIO COPIAPO, CHILE,
Instituto de Investigaciones Geologicas, Santiago (Chile); Queen's Univ., Kingston (Ontario). Dept. of Geologic Sciences; and New Mexico Highlands Univ., Las Vegas. Dept. of Chemistry.
For primary bibliographic entry see Field 02J.
W71-05601

MICROWAVE DIELECTRIC MEASUREMENT ON ANOMALOUS WATER,
Cold Regions Research and Engineering Lab., Hanover, N.H. and Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
For primary bibliographic entry see Field 01B.
W71-05602

PRECIPITATION OF VATERITE IN LAKE WATER,
Atomic Energy Research Establishment, Harwell (England).
D. L. G. Rowlands, and R. K. Webster.
Nature Physical Science, Vol 229, No 5, p 158, February 1971. 1 p, 9 ref.

Descriptors: *Lakes, *Water properties, *Calcium carbonate, *Chemical precipitation, Laboratory tests, Methodology, Electron microscopy, X-ray diffraction, Water chemistry.
Identifiers: *Vaterite precipitation (Lake water).

Vaterite is a microcystalline form of calcium carbonate. It is rarely observed in nature, but has now been identified in a precipitate formed in Holkham Lake, Norfolk (England). The lake is nearly one mile long, is fed by springs at the south end and discharges over a weir towards the sea at the north. At the south end a narrow stretch, about 200 yards long, is separated from the main body of the lake by a low dam which maintains a slightly higher water level. In spring 1970, the water at the south end developed a marked milky opalescent appearance. Biological investigations showed no unusual species at either end of the lake, and no evidence of pollution. Chemical and structural analyses identified the suspended material as chiefly calcium carbonate. The chief point of interest is the crystal form of the precipitate. Suspended matter, separated in the laboratory by 'Millipore' filtration of lake water samples, was examined by electron microscopy; crystals were identified by electron diffraction as vaterite. This was confirmed by X-ray diffraction measurements. (Woodard-USGS)
W71-05603

STABILITY OF MONTMORILLONITES: 1. BELLE FOURCHE AND CLAY SPUR MONTMORILLONITES,
Washington State Univ., Pullman. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W71-05605

LOW-TEMPERATURE PHASES OF INTERFACIAL WATER IN CLAY-WATER SYSTEMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02G.
W71-05607

MICROCOLUMN CHROMATOGRAPHIC CLEANUP FOR THE ANALYSIS OF PESTICIDES IN WATER,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-05614

SALT EFFECTS IN AQUEOUS SOLUTIONS OF UREA,
Richard E. Lindstrom, and Alexander R. Giaquinto.
Journal of Pharmaceutical Sciences, Vol 59, No 11, p 1625-1630, 1970. 6 p, 4 fig, 3 tab, 11 ref. OWRR Project A-024-CONN (1).

Descriptors: *Urea, *Aqueous solutions, *Chemical reactions, *Salts, Acidity, Alkalinity, Electrolytes, Ionization, Methodology, Test procedures, Model studies, Solubility, Chemical properties, Spectrophotometry, Chemical analysis, Sodium chloride.
Identifiers: Methyl salicylate solubility, Benzoate solubility.

It is suggested, when working with drug-urea-water systems, that more than passing consideration be given to the effect or effects produced by addition of a fourth component, as, for example, when an acid is used to adjust pH. Data are cited which indicate that these effects are measurable and often predictable. Solubility data for methyl salicylate and methyl benzoate are given as functions of varying acid, salt, and urea concentrations. These data represent the equilibrium solubilities of the esters in the various systems at 30 degrees. The solubilities were obtained by sampling and subsequent determination of the ester concentration using UV spectrophotometry. A mathematical model was derived which permits a quantitative evaluation of salt effects in urea solutions. The theoretical calculations, based on this model, were found to be in good agreement with the experimental values observed for neutral and pH 1 solutions of methyl salicylate and methyl benzoate in urea. Extension of these findings to an earlier investigation indicates that significant error in interpretation of solubility in urea may result if these salt effects are disregarded. (Woodard-USGS)
W71-05618

MARINE HYDROCHEMISTRY,
For primary bibliographic entry see Field 02L.
W71-05666

ANALYSIS OF TIME-VARIANT BEHAVIOR OF WATER CHEMISTRY,
Nevada Univ., Reno. Center for Water Resources Research.
John V. A. Sharp.
American Geophysical Union, 51st Annual Meeting, Preprint No 71, Paper H-23. April 21, 1970. 10 p, 4 fig. OWRR Project A-017-NEV (3) and A-024-NEV (3).

Descriptors: *Analytical techniques, *Water chemistry, *Time series analysis, *Variability, Model studies, Mathematical models, Water quality, Testing, Hydrology, Water management (Applied), Equations, Hydrologic data, Stochastic processes, Water analysis, Rivers, Cycles, Time, Nevada, Sampling.
Identifiers: *Truckee River, *Cyclical behavior, *Trend behavior, *Constant behavior, *Oscillatory behavior.

Time-variant behavior can be modeled as a discontinuous time-series, composed of time-systematic and stochastic components. The stochastic component is a residual of random fluctuations and sampling. The four model behavior types recognized are constant, trend, cyclical, and oscillatory. Graphs illustrate and generating functions are given for each behavior. Sometimes visual observation alone may suffice to classify the type of time-variant behavior, but in questionable cases, one or more specific tests must be used to determine which type of behavior has been generated from the constant parent behavior. Serial correlation using coefficients r sub k, the rank correlation tau test for confirming trends and establishing direction, the turning points test for fluctuation frequency, and the runs test used to detect values above or below median values, are all used to determine into which of the four categories a time-variant behavior series may fall. Examples of the various behaviors using actual measurements on the Truckee River and a well in Nevada are given with explanatory graphs. The behaviors are illustrated and defined by use of equations. (Yensen-Arizona)
W71-05705

RECOVERY, SEPARATION, AND IDENTIFICATION OF PHENOLIC COMPOUNDS FROM POLLUTED WATERS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 05A.
W71-05768

2L. Estuaries

ORIGIN OF CLAY MINERALS IN A MID-ATLANTIC RIDGE SEDIMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 02J.
W71-05347

MODELING OF THE NITROGEN AND ALGAL CYCLES IN ESTUARIES,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Program.
R. V. Thomann, D. J. O'Connor, and D. M. Ditoro.
Proceedings, 5th International Water Pollution Research Conference, Paper III-9, July-August 1970. 14 p, 9 fig, 1 tab, 10 ref.

Descriptors: *Mathematical models, *Nitrogen cycle, *Oxidation, Ammonia, Nitrites, Oxygen, Phytoplankton, Biochemical oxygen demand, Dissolved oxygen, Estuaries, Water pollution effects, Water pollution sources, Nitrification, Algae.
Identifiers: Algal cycle, Delaware Estuary (Del-NJ), San Joaquin Delta (Calif), Steady-state models.

Two mathematical models were constructed to address the problems of nitrogen and algal cycles. The steady-state, multi-demensional model was used for analyzing nitrification and algal utilization of available nitrogen. The dynamic model incorporated the growth and death of phytoplankton and herbivorous zooplankton and the utilization of inorganic nitrogen. Application of the first model to the Delaware Estuary indicated the rate of ammonia oxidation of about 0.1/day at 20C with nitrification inhibition at DO less than 1-2 mg/l. A lower DO resulted from nitrogen oxidation. The same model applied to the Potomac Estuary indicated algal utilization of nitrates at 0.1/day at 20C. The dynamic non-linear model, applied to Sacramento-San Joaquin Delta, (Calif) adequately described the algal growth and utilization of nutrients. The net algal growth coefficient ranged up to 0.3/day during the spring. (Wild-Wisconsin)
W71-05390

SOME EFFECTS OF TEMPERATURE ON SURVIVAL AND METABOLISM OF SELECTED ESTUARINE BIVALVES,
Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-05406

A TECHNICAL ASSESSMENT OF CURRENT WATER QUALITY CONDITIONS AND FACTORS AFFECTING WATER QUALITY IN THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05407

SANITARY BACTERIOLOGY OF THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05C.
W71-05408

WATER QUALITY AND WASTE WATER LOADINGS UPPER POTOMAC ESTUARY DURING 1969,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05409

POTOMAC-PISCATAWAY DYE RELEASES AND WASTE WATER ASSIMILATION STUDIES,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05410

UPPER POTOMAC RIVER BASIN WATER QUALITY ASSESSMENT,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05411

FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 02E.
W71-05461

WATER RESOURCES POTENTIAL OF AN URBAN ESTUARY (SAUGUS RIVER, PINES RIVER AND LYNN HARBOR COMPLEX),
Northeastern Univ., Boston, Mass. Dept. of Civil Engineering; and Northeastern Univ., Boston, Mass. Dept. of Environmental Science.
For primary bibliographic entry see Field 05C.
W71-05553

BIOLOGICAL AND CHEMICAL STUDY OF VIRGINIA'S ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
Morris L. Brehmer.
In: Virginia Polytechnic Institute and State University Water Resources Research Center Bulletin 40, p 121-125, December 1970. 5 p. OWRR Project B-003-VA.

Descriptors: *Estuaries, *Virginia, *Water quality, *Reviews, Surveys, Dissolved oxygen, Salinity, Nutrients, Eutrophication, Ecology, Saline water intrusion.
Identifiers: Chesapeake Bay.

Virginia's estuaries are dynamic systems characterized by high levels of instability. The reaches near Chesapeake Bay are the most stable since they are least affected by variations in freshwater inflow from the tidal river. The middle reach encompasses the gradient zone in which the water may be completely fresh during extremely high discharge periods and approach 50% seawater during drought conditions. The location of the transition zone between fresh and salt water also shifts with discharge levels and may vary as much as 20 miles upstream and downstream from the 'average' point within a season. Dissolved oxygen levels in Virginia's three major estuarine systems did not approach extremely low values during the study period. (See also W71-05555) (Knapp-USGS)
W71-05558

DEPOSITIONAL PROCESSES AND PRODUCTS IN THE DELTAIC ENVIRONMENT,
Louisiana State Univ., Baton Rouge.
James P. Morgan.
In: Deltaic Sedimentation, Modern and Ancient, Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 31-47, November 1970. 17 p, 13 fig, 2 tab, 34 ref.

Descriptors: *Deltas, *Sedimentation, *Sedimentary structures, Mississippi River, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Paleohydrology, Sedimentology, Stratigraphy, Reviews.
Identifiers: *Mississippi Delta, *Ganges-Brahmaputra Delta, *Mekong Delta.

Factors controlling depositional processes and products are analyzed for three of the world's major river-delta systems; the Mississippi, Ganges-Brahmaputra, and Mekong. These three river

systems have deltas with varied geomorphic form which reflects differences in depositional processes. Four basic factors control and influence delta formation: (1) river regime; (2) coastal processes; (3) structural behavior and the relation of sea level to the depositional site; and (4) climatic factors, particularly those that affect vegetation within the delta. The Mississippi delta area is characterized by rapid subsidence, primarily through sediment compaction, and its deposits are subject only to minor modification by coastal processes. The Ganges-Brahmaputra delta is also tectonically controlled but by Quaternary faulting as well as by subsidence through sediment compaction. The Mekong has created a single delta system which has prograded across an essentially rigid platform. Contemporaneously, coastal processes (tides, waves, and currents) have reworked the delta front, creating sand beaches which merge laterally to form widespread sheet sands in the deltaic plain. (Knapp-USGS)
W71-05572

STRATIGRAPHY AND HISTORY OF THE HOLOCENE SEDIMENTS IN THE SABINE-HIGH ISLAND AREA, GULF OF MEXICO,
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
Henry F. Nelson, and Ellis E. Bray.
In: Deltaic Sedimentation, Modern and Ancient, Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 48-77, November 1970. 30 p, 13 fig, 5 plate, 2 tab, 36 ref, append.

Descriptors: *Deltas, *Gulf of Mexico, *Sedimentation, *Sedimentary structures, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Paleohydrology, Sedimentology, Stratigraphy, Coastal plains.
Identifiers: *Sabine River (La), *Calcasieu River (La).

The Holocene sediments on the northwest shelf of the Gulf of Mexico were formed in interdeltaic as well as deltaic areas during the postglacial rise of the sea and during its stillstand since it reached its present level. In an interdeltaic area of relatively minor sedimentation off the Texas coast, the Sabine-High Island area, 11 lithotypes were defined during a three-dimensional study of the Holocene sediments. With the exception of one type, peat, all are made up of various combinations of three major sediment components, clay, quartz sand, and shells. These sediments were deposited as five lithofacies on an eroded Pleistocene surface that was crossed by a major topographic feature, the channel of the Sabine and Calcasieu Rivers. The three most important factors controlling the distribution of sediments are topography, variations in the rate of rise of the sea, and currents. (Knapp-USGS)
W71-05573

THE MISSISSIPPI DELTA COMPLEX,
Esso Production Research Co., Houston, Tex.
H. R. Gould.
In: Deltaic Sedimentation, Modern and Ancient, Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 3-30 November 1970. 28 p, 25 fig, 1 tab, 14 ref.

Descriptors: *Deltas, *Mississippi River, *Sedimentation, *Sedimentary structures, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Paleohydrology, Sedimentology, Stratigraphy, Reviews.
Identifiers: *Mississippi Delta.

The Mississippi delta complex is one of the largest and probably best known of the world's major delta systems. Its subaerial surface, the Mississippi deltaic plain, extends from an apex at the mouth of the Mississippi alluvial valley to a base of 200 miles along the Louisiana coast. Underlying this plain and the adjacent continental shelf and slope is a huge mass of late Quaternary river-mouth deposits which makes up the deltaic complex. These sediments occupy a seaward deepening troughlike depression in the underlying surface that developed contemporaneously with deposition and which is localized to the depositional area. Downwarping of this segment of the continental margin, together with the eustatic rise in sea level during late Quaternary time, was sufficient to accommodate the great thickness of deposits which reaches a known maximum of about 1,000 feet underlying the continental shelf at the seaward limit of control. Both the shallow-water deltas and the active deep-water birdfoot delta are characterized by distinctive facies which are readily recognized by their lithologic, faunal, and geometric features. (Knapp-USGS)
W71-05574

HOLOCENE GUADALUPE DELTA OF TEXAS GULF COAST,
West Virginia Univ., Morgantown, and Campbell Coll. Buies Creek, N.C., and Esso Standard Libya, Inc., Tripoli.
Alan C. Donaldson, Richard H. Martin, and William H. Kanes.
In: Deltaic Sedimentation, Modern and Ancient, Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 107-137, November 1970. 31 p, 18 fig, 4 tab, 35 ref, 1 plate.

Descriptors: *Deltas, *Sedimentation, *Texas, *Gulf of Mexico, *Sedimentary structures, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal Plains.
Identifiers: *Guadalupe River Delta (Tex).

The Holocene delta of the Guadalupe River is slowly prograding into San Antonio Bay of the Texas Gulf Coast. The delta is part of a modern complex of lagoonal and deltaic sediments deposited along a shoreline dominated by barrier islands. The river deposits its load in a shallow, relatively quiet body of water, and as the delta progrades into increasingly shallow water, distributary channels have become deeper than the present bay floor. Sediments are clay and silty clay except for the basal part of the distributary-channel and delta-front deposits, which are fine-grained sand, silty sand, or silt. Where the delta is birdfoot, the delta-front deposits are shoestring (bar-finger) sands. The overall configuration of the Guadalupe delta is birdfoot. Characteristics which make the Guadalupe delta a distinctive model are: (1) the river discharge and load overwhelm the weaker currents and waves of the bay, (2) deposition is in such a shallow body of water that waves can rework the bay sediments, (3) the river channels are deeper than the present bay floor, (4) the bay is becoming progressively shallower as the delta progrades, and (5) growth is by development of successive subdeltas, most of which are presently deteriorating. (Knapp-USGS)
W71-05575

TRANSPORT OF TRACE METALS TO THE ATLANTIC OCEAN BY THREE SOUTHEASTERN RIVERS,
Skidaway Inst. of Oceanography, Savannah, Ga; and Georgia Inst. of Tech. Atlanta.
For primary bibliographic entry see Field 05B.
W71-05579

SEDIMENT BUDGETS ON A COMPARTMENTED LOW-TO-MODERATE ENERGY COAST IN NORTHWEST FLORIDA,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 02J.
W71-05584

MEASUREMENTS OF INCIPIENT MOTION OF SEDIMENT PARTICLES IN THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
Richard W. Sternberg.
Marine Geology, Vol 10, No 2, p 113-119, Februry 1971. 7 p, 3 fig, 1 tab, 16 ref. Contract AT (41)-1752 USAEC Grant GA 11149 NSF.

Descriptors: *Sediment transport, *Bottom sediments, *Tides, *Bed load, *Currents (Water, Tidal effects, Velocity, Fluid friction, Hydraulic, Channel morphology, Erosion, Particle size, Density, Boundary layers.
Identifiers: Puget Sound (Wash).

During the past few years a series of measurements has been made of flow conditions and associated sediment motion occurring in several high-velocity tidal channels in Puget Sound, Washington. Measurements consist of the velocity distribution occurring within 2 m of the bed, visual observation of the occurrence of incipient grain movement, and time-lapse photography of the seabed. From these data estimates have been made of the mean bottom velocity, shear velocity, and Shield's friction coefficient associated with the sediment movement. For mean grain sizes ranging from 0.30 mm to 1.10 mm and a variety of bed configurations, the critical values of velocity and friction required to initiate general sediment motion agree with experimentally derived competency curves. The bed-load transport of sediment corresponding to the occurrence of general sediment motion for grain sizes approximately 0.40 mm in diameter is estimated to be 0.0084 gm per cm per sec. This movement is associated with mean velocity and shear velocity of 38.5 and 2.30 cm per sec, respectively. (Knapp-USGS)
W71-05585

A COMPUTER SIMULATION MODEL OF SEDIMENTATION IN A SALT WEDGE ESTUARY,
Sheffield Univ. (England). Dept. of Geology.
D. G. Farmer.
Marine Geology, Vol 10, No 2, p 133-143, February 1971. 11 p, 4 fig, 28 ref.

Descriptors: *Simulation analysis, *Mathematical models, *Computer programs, *Sedimentation, *Estuaries, Sediment transport, Deltas, Deposition (Sediments), Saline water intrusion, Stratified flow, Density stratification.
Identifiers: Sedimentation models, Salt-wedge estuaries.

Simulation with a digital computer was applied in the field of estuarine sedimentation. A simulation model of sedimentation in the relatively simple 'salt wedge' type of estuary was considered in terms of a section of intrusion of the salt wedge extending from the mouth, and a fresh water section up stream. The model is illustrated by an experiment in which constant input conditions are assumed. (Knapp-USGS)
W71-05586

BOTTOM CURRENTS IN WILMINGTON SUBMARINE CANYON,
Governors State Univ., Park Forest, Ill.; University Coll. of Swansea (Wales). Dept. of Geology; and Smithsonian Institution, Washington, D.C. Sedimentology Div.
Peter Fenner, Gilbert Kelling, and Daniel J. Stanley.
Nature Physical Science, Vol 229, No 2, p 52-54, January 11, 1971. 3 p, 1 fig, 12 ref.

Descriptors: *Sediment transport, *Bottom sediments, *Continental shelf, *Ocean currents, *Atlantic Ocean, Ships, Investigations, Methodology, Photography, Flow, Velocity, Current meters, Data collections, Evaluation.
Identifiers: *Wilmington Canyon (Atlantic Ocean).

The data on bottom currents presented here were obtained from near the head of Wilmington Canyon, which indents the outer margin of the continental shelf 140 km southeast of Delaware Bay. Underwater photography of the seafloor in this region revealed fresh ripple-marks and other features

indicating recent bottom current activity. An underwater television survey during July 1968 obtained direct evidence of current activity within the canyon and on the adjacent continental shelf and slope. Current flows, with an estimated maximum velocity of 25 cm s to the minus one, were observed from the videotapes, moving turbid water just above the seafloor near the canyon margins. The velocities recorded show that these currents are capable of moving sediment of fine to medium sand, and this material is transported across the outermost shelf and trapped in the canyon head. Once in the canyon, bottom sediment is acted on by axial currents of similar competency but of possible oscillatory character, which ultimately produce net down-canyon transport of the sediment. (Woodard-USGS)
W71-05600

THE SEDIMENTARY FRAMEWORK OF MORETON BAY, QUEENSLAND,
Sydney Univ. (Australia). Dept. of Geology and Geophysics.
W. G. H. Maxwell.
Australian Journal of Marine and Freshwater Research, Vol 21, No 2, p 71-88, December 1970. 8 p, 11 fig, 17 ref.

Descriptors: *Sedimentation, *Provenance, *Bays, Sand bars, Dunes, Reefs, Sedimentary structures, Stratigraphy, Carbonate rocks, Sands, Deposition (Sediments), Sediment transport.
Identifiers: *Moreton Bay (Queensland), *Australia.

Moreton Bay occupies an area of 540 sq miles on the south-east Queensland (Australia) shelf, and is bordered on the east by high barrier islands. It is divisible into a deep northern sector and a narrower southern region with numerous small sand islands. Vigorous tidal activity has resulted in tidal deltas and sand ridges on the northern and eastern margins. The main sedimentary pattern in the Bay is determined by the Mesozoic and Cainozoic history of the region, particularly the tectonic and eustatic variation. At the present time, the main sediment source is from the shelf and barrier islands where ancient dune deposits are feeding the Bay. The main contribution from the western land mass is mud, which is largely restricted to the western part of the Bay. Relict coral reefs and existing coral communities contribute to a carbonate facies which is very restricted in distribution. The main movement of sediment is by tidal currents which are most effective on the eastern side of the Bay where the sediment is predominantly quartz sand. (Knapp-USGS)
W71-05615

MARINE HYDROCHEMISTRY,
L. K. Blinov.
Available from NTIS as AD-711 925, $3.00 in paper copy, $0.95 in microfiche. Cold Regions Research and Engineering Lab., Hanover, N.H. Translation, 1970. 76 p. Trans. from Trudy Gos. Okeano. Inst-ta, No 83, 1965.
Identifiers: *Salinity, *Oceanology, *Sea ice, Salinity, Hydrology, Sea water, Concentration (Chemistry), Phase studies, Chlorides, Salts, USSR, Chlorinity, Translations.

The report consists of two chapters of an unfinished book, 'Khimiya Morya' ('Marine Chemistry'). It discusses the salt composition of ocean waters, salinity and the composition of salts in sea ice in relation to processes of phase transitions and formation of ice from sea water as a complex solution.
W71-05666

BACKGROUND PAPERS ON COASTAL WASTES MANAGEMENT.
National Academy of Sciences-National Research Council, Washington, D.C. Committee of Oceanography; and National Academy of Engineering, Washington, D.C. Committee on Ocean Engineering.
For primary bibliographic entry see Field 05B.
W71-05787

NEW YORK CITY - A MAJOR SOURCE OF MARINE SEDIMENT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05B.
W71-05790

PHYSICAL PROCESSES IN COASTAL AREAS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05B.
W71-05792

PHYSICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05B.
W71-05793

SOME CHEMICAL AND GEOCHEMICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W71-05798

BIOLOGICAL EFFECTS OF WASTE DISCHARGES ON COASTAL RECEIVING WATERS,
Engineering-Science, Inc, Forest Hills, N.Y.; and Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 05C.
W71-05799

BIOLOGICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W71-05801

THE COASTAL POLLUTION PROBLEM IN CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W71-05802

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

METHODOLOGICAL ASPECTS OF TECHNICO-ECONOMIC PARAMETERS OF NUCLEAR DESALINATION PLANTS,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
Yu I. Koryakin, A. A. Loginov, and V. A. Chernyaev.
Desalination, Vol 7, p 323-342, 1970. 3 fig, 6 ref.

Descriptors: *Desalination plants, *Financial analysis, *Nuclear powerplants, *Cost analysis, Economics, Methodology, Technology, Thermal power, Heat, Distillation, Cost comparisons.
Identifiers: *Power and water production, Ginter triangle.

Technical and economic parameters of nuclear desalination plants are outlined. The suggested methodology is based on the category of 'evaluated expenditure,' widely used in the USSR in different sectors of national economy. The analysis of existing methods of appraisal of costs of a plant producing electricity and heat permitted a formulation of a generalized method. The latter eliminates shortcomings of other approaches and is considered to be the most advantageous; it presents a correct distribution of costs of the nuclear total expenditure of a power station. (Wilde-Wisconsin)
W71-05404

DESALINATION - A SURVEY OF AUSTRALIAN PLANTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Engineering; and Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
L. S. Herbert, and D. H. Moffatt.
Australian Water Resources Council Research Project No 68/6, 1970. 142 p, 8 fig, 15 plate, 2 tab.

Descriptors: *Desalination, *Reviews, *Arid lands, *Water costs, Distillation, Reverse osmosis, Electrodialysis, Ion exchange, Water quality, Water treatment.
Identifiers: *Australia, *Desalination (Australia).

Detailed information was obtained on costs and aspects of operation during visits to 12 desalination plants in Australia. Existing, proposed and formerly operating plants are listed. A summary is given of the main design, operational and cost data relating to the 8 plants surveyed for which detailed information was available. Some plants are being used below their design capacity because the water is not required during some part of the year, while others do not achieve design capacity because of operational difficulties in heat supply, excessive downtime for scale removal, major mechanical problems, etc. Of the plants surveyed, larger plants appear to operate more satisfactorily than smaller plants. Those plants designed for, and operating on weakly saline waters, presented fewer problems in operation than plants designed for, and operating on sea water. (Knapp-USGS)
W71-05613

3B. Water Yield Improvement

INTERPRETATION OF ELECTRIC AND GAMMA RAY LOGS IN WATER WELLS,
Gearhart-Owen Industries, Inc., Fort Worth, Tex.
For primary bibliographic entry see Field 04B.
W71-05688

A STUDY OF THE MECHANISMS AND SUPPRESSION OF EVAPORATION OF WATER FROM SOILS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 02D.
W71-05717

COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES: A QUARTER-CENTURY OF UNITED STATES ASSISTANCE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
Frederick E. McJunkin.
Department of State Agency for International Development, Washington, DC, 1969. 86 p. Supported by Office of International Health, United States Public Health Service.

Descriptors: *Water supply, *Foreign countries, *Federal government, *Sanitation, Reviews, *Training, *Foreign research, Regions, *Geographical regions, *Public health, *Economic impact, Social impact.
Identifiers: *Foreign aid, Brazil, East Pakistan, Thailand, Yemen.

The history and status of United States technical and capital assistance (a billion dollars since 1942) for water supply in developing countries are reviewed by region and country, including its context as part of foreign aid generally and its growth from early days (1942) in Latin America to a global program and an important element of multilateral programs. The essential role of water supply in developing countries (why foreign aid for water supply) is reviewed with particular attention to health (500 million water-related illnesses annually), economic development, nutrition, population control, and political and social development. Current deficiencies and needs are outlined by region. Six projects from the hundreds undertaken are highlighted as examples of educational assistance (Regional School of Sanitary Engineering for Central America), development and strengthening of a national water supply program (Brazil), institution-building (Department of Public Health Engineering in East Pakistan), technological development (new handpump for wells), capital assistance (John F. Kennedy Memorial Water System in Yemen), and rural water supply (Thailand). Lessons and observations based on a quarter-century of experience include: (1) community water supplies in developing countries are still generally inadequate despite recent progress; (2) community water supplies are essential investments for community development and sustained economic growth, they encourage progressive forces, emphasize human progress, and stimulate self-help concepts; (3) a self-liquidating water supply system is a feasible goal for urban communities of even the poorest countries; (4) well-conceived, well-engineered water supply projects can attract international financing; (5) preventive health programs that ignore water supply are invariably failures; (6) deficiencies in personnel and in institutions are currently the critical factors in development of community water supplies, not technology and probably not capital--a realistic program for improvement will require attention to institution building and personnel training; (7) the major accomplishment of the Community Water Supply Program is not hardware but the progress to date in establishment or strengthening of water supply institutions; however technical assistance must be continued until these have ripened to full maturity.
W71-05821

3C. Use of Water of Impaired Quality

HYDROLOGICAL PROBLEMS RELATED TO THE USE OF SALINE WATERS,
Council of Scientific and Industrial Research, New Delhi (India).
S. Banerji.
Nature and Resources, Vol V, No 2, p 13-15, June 1969.

Descriptors: *Saline water, *Water utilization, *Water resources development, *Water quality, *Planning, United Nations, Foreign countries, Research and development, Salinity, Water types, Hydrologic aspects, Sea water, Surface waters, Subsurface waters, Aquifers, Fresh water, Reclamation, Water policy.

A panel of experts from various United Nations agencies met to discuss problems related to use of saline waters. The panel identified types of hydrological processes producing water salinity of surface and subsurface waters in both inland and coastal or marine areas. Categories of water salinity were established, rating waters as fresh, mineralized, slightly saline, moderately saline, saline, oceanic, and briny according to proportions of total dissolved salts present. Uses of saline water having a hydrological impact were agriculture and fisheries, urban and rural water supplies, industrial use, navigation, and demineralization. The panel drafted questionnaires to be sent to countries using saline water to elicit more information on the use of saline waters and the handling of related problems. Effects produced by upstream development of rivers and use of fresh waters were listed, including effects of irrigation, changing land use, evapotranspiration, over-extraction of groundwater, reclamation of coastal areas, sea-water intrusion, decreased river flow, improvement of navigational facilities and development of oil fields. The panel will prepare a bibliography of works dealing with saline water, make an inventory of saline waters potentially available for use, prepare maps of such waters, and disseminate all findings of the panel. (Yensen-Arizona)
W71-05465

GROWTH OF ATRIPLEX HALIMUS L. IN SODIUM CHLORIDE SALINATED CULTURE SOLUTIONS AS AFFECTED BY THE RELATIVE HUMIDITY OF THE AIR,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W71-05714

3D. Conservation in Domestic and Municipal Use

FUTURE WATER DEMANDS - THE IMPACTS OF TECHNOLOGICAL CHANGE, PUBLIC POLICIES, AND CHANGING MARKET CONDITIONS ON THE WATER USE PATTERNS OF SELECTED SECTORS OF THE UNITED STATES ECONOMY: 1970-1990,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06D.
W71-05339

3E. Conservation in Industry

FUTURE WATER DEMANDS - THE IMPACTS OF TECHNOLOGICAL CHANGE, PUBLIC POLICIES, AND CHANGING MARKET CONDITIONS ON THE WATER USE PATTERNS OF SELECTED SECTORS OF THE UNITED STATES ECONOMY: 1970-1990,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06D.
W71-05339

EFFECT OF WATER RESOURCES ON ECONOMIC GROWTH IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
For primary bibliographic entry see Field 06D.
W71-05382

3F. Conservation in Agriculture

FUTURE WATER DEMANDS - THE IMPACTS OF TECHNOLOGICAL CHANGE, PUBLIC POLICIES, AND CHANGING MARKET CONDITIONS ON THE WATER USE PATTERNS OF SELECTED SECTORS OF THE UNITED STATES ECONOMY: 1970-1990,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06D.
W71-05339

MANAGEMENT OF AGRICULTURAL RESOURCES TO MINIMIZE POLLUTION OF NATURAL WATERS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W71-05341

CONTROL OF WATER POLLUTION FROM SOUTHWESTERN CATTLE FEEDLOTS,
Texas Tech Univ., Lubbock. Water Resources Research Center.
For primary bibliographic entry see Field 05D.
W71-05412

EQUIPMENT FOR DISPOSAL OF AGRICULTURAL EFFLUENTS,
National Agricultural Advisory Service, Londo (England).
For primary bibliographic entry see Field 05D.
W71-05413

FERTILIZATION OF ANNUAL RANGELAN WITH CHICKEN MANURE,
California Univ., Riverside. Dept. of Agronomy.
For primary bibliographic entry see Field 05D.
W71-05419

AGRICULTURAL PRACTICES AND WATE QUALITY.
For primary bibliographic entry see Field 05B.
W71-05437

POTENTIAL USEFULNESS OF ANTITRANS PIRANTS FOR INCREASING WATER USE EF FICIENCY IN PLANTS,
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 02I.
W71-05443

THE EFFECT OF ANTITRANSPIRANT MATERIALS ON THE RADIATION BALANCE AND EVAPORTANSPIRATION IN AN IR- RIGATED ALFALFA FIELD, ADDENDUM TO FINAL REPORT,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 02D.
W71-05453

PRODUCTION, CRUDE PROTEIN, AND USE OF 11 IRRIGATED GRASSES AND ALFALFA-GRASS COMBINATIONS ON CLAY SOILS IN WESTERN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Range Management.
James R. Johnson, and James T. Nichols.
South Dakota Agricultural Experiment Station, Bulletin 555, April 1969. 15 p, 7 tab, 3 fig, 22 ref.

Descriptors: *Crop production, *Crop response, *Proteins, *Grasses, *Fertilization, Soil-water-plant relationships, Cutting management, Alfalfa, Fertility, Nitrogen, Growth rates, Persistence, Economic prediction, Grazing, Wheatgrasses, Range management, Watershed management, Seasonal, Clays, South Dakota, Great Plains.
Identifiers: *Irrigated grasses, Semiarid lands.

To determine regional suitability based on production, crude protein percentage, season of growth, and persistence under irrigation, 11 grasses were grown on clay soils in 3 ways: (1) without supplemental fertility; (2) with 100 pounds of nitrogen per acre annually; and (3) in association with alfalfa. Data were collected for 4 seasons. Average fertilized grass yield of 6,205 pounds per acre. Grass from the alfalfa-grass combinations almost equaled non-fertilized grass production. Alfalfa-grass combination provided the best production distribution for multiple cuttings or growing season grazing. Fertilized grass gave the largest single forage cutting. Non-fertilized grass could not economically compete with other irrigated crops. Nitrogen treatment enhanced protein percentage. Earliest grazing could be made by crested wheatgrass, followed by other wheatgrasses. This information is useful for optimal range and watershed management in the Northern Great Plains. (Popkin-Arizona)
W71-05464

SELECTED CHARACTERISTICS OF REPRESENTATIVE IRRIGATED AND DRY-LAND FARMS AND RANCHES IN THE BELLE FOURCHE AREA,
Economic Research Service, Brookings, S. Dak.
Charles C. Micheel.

Funded in part by the U.S. Department of Agriculture, Economic Research Service, Farm Production Economics Division. South Dakota Agricultural Experiment Station, Bulletin 556, May 1969. 16 p, 24 tab, 2 fig, 5 ref.

Descriptors: *Irrigated land, *Dry farming, *Operating costs, *Irrigation programs, *Comparative productivity, Livestock, Value, Employment, Prices, Hay, Oats, Barley, Corn (Field), Farm management, South Dakota.
Identifiers: Belle Fourche Irrigation Project, Semiarid lands.

Data for 1963 from farms and ranches on the Belle Fourche Irrigation Project and surrounding drylands in northwestern western South Dakota are used to describe and compare dryland and irrigated units. Livestock, mainly beef cattle and sheep, are raised on most units. Net worth of irrigated farms average $20,130 on 240-acre units to $35,675 on 720-acre units. Younger operators are on larger units. One-third of the irrigation operators had part-time off-farm jobs earning an average of $1,700 per year, and 10% of the wives had year-round full-time earnings of $3,100. Fewer dryland operators or wives had off-farm work. Irrigation operators listed 'lack of rain' as a major problem. Both groups listed 'low prices and high costs' as a secondary problem. About 8% of the hay, 1% of the barley, 10% of the oats, and 24% of the corn raised on irrigated units was sold for cash. Dryland feed was not sold for cash. Little interdependence between irrigation and dryland operators was found, except where operators have some irrigated cropland and some rangeland, as was the case in 6 of the 69 sample units studied. Tables summarize production, cost, cultural practices, and size and distribution of agricultural units. (Popkin-Arizona)
W71-05466

AUSTRALIAN-AMERICAN INTERBASIN WATER TRANSFER,
Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W71-05477

COSTS FOR GROWING POTATOES UNDER SELF-MOVING CIRCULAR SPRINKLERS,
Wyoming Agricultural Extension Service, Laramie.
Douglas E. Agee.
Wyoming Agricultural Extension Service, Bulletin 502, July 1969. 12 p, 1 fig, 9 tab, 1 ref.

Descriptors: *Operating costs, *Crop production, Efficiencies, *Comparative productivity, *Sprinkler irrigation, Farm management, Fertilization, Seeds, Production, Furrow irrigation, Labor, Potatoes, Wyoming.
Identifiers: *Circular sprinklers, Semiarid lands.

Interviews of 5 potato growers in southeastern Wyoming, who produced 62% of the total 1968 acreage, were used to obtain physical and financial information for crop production under circular sprinklers. Operators used 13 man hours and 3.2 tractor hours to produce an acre of potatoes. Large tractors and machinery on large fields and minimum tillage techniques were used. Seeding fertilization, and water application rates conformed with research recommendations. Total production costs average $227 per acre for an expected 250 hundredweight, which includes $28 for labor, $168 for other cash costs, and $31 for noncash items on an expected yield of 250 sacks at 91 cents per sack. This compares to a 1966-furrow irrigation cost of $222 per acre, or na adjusted 1968 per acre cost of $258. Potato growers who use circular sprinklers in Wyoming produce larger acreages than average, are highly efficient in operations, and are skilled in production techniques. Tables show physical and financial data of circular sprinkler and furrow irrigation. (Popkin-Arizona).
W71-05479

WATER REQUIREMENTS OF SUGARCANE UNDER IRRIGATION IN LAJAS VALLEY, PUERTO RICO,
Puerto Rico Univ., Mayaguez. Agricultural Experiment Station.
Roberto Vazquez.
Available from NTIS as PB-197 992, $3.00 in paper copy, $0.95 in microfiche. Puerto Rico University Agricultural Experiment Station Bulletin 224 (WRRI-FR-71-5) July 1970. 36 p, 4 fig, 15 tab, 9 ref. OWRR Project A-005-PR (1).

Descriptors: *Irrigation, *Sugarcane, *Puerto Rico, *Water requirements, Testing, Experimental forms, Methodology, Soil moisture, Fertilizers, Soil treatment, Irrigation efficiency, Rates of applications, Crop response, Crop production, Soil-water-plant relationships.
Identifiers: *Lajas Valley (Puerto Rico).

Field experiments were conducted in Puerto Rico at the Lajas Substation to determine optimum soil moisture conditions necessary to produce maximum sugarcane and sugar yields. Twenty irrigation regimes were tested. Some of the plots were irrigated frequently and others were irrigated less frequently in the active root zone throughout the growing period. Nitrogen fertilizer treatments were tested at the rate of 200 and 300 pounds per acre per crop. Data were taken for a 13-month plant cane and two 12-month ratoons of sugarcane. The plant cane used more water than the ratoon crop. The mean consumptive use per day was 0.160 inch for plant cane and 0.154 inch for ratoon in the frequently irrigated plots throughout the growing period. The average of the combined yields of a plant cane and two ratoons were 73.67 tons of sugarcane and 7.80 tons of sugar per acre in the frequently irrigated plots, and 59.37 tons of sugar cane and 6.40 tons of sugar per acre in the less frequently irrigated plots. There was no significant difference in yields between plots fertilized at rates of 200 and 300 pounds of nitrogen per acre per crop. (Woodard-USGS)
W71-05554

AVAILABLE WATER AS RELATED TO EVAPOTRANSPIRATION RATES AND DEEP DRAINAGE,
Agricultural Research Service, Prosser, Wash.
For primary bibliographic entry see Field 02G.
W71-05606

EFFECT OF TRICKLE IRRIGATION INTERVALS ON DISTRIBUTION AND UTILIZATION OF SOIL MOISTURE IN A VINEYARD,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation; and Ministry of Agriculture, Rehovoth (Israel).
For primary bibliographic entry see Field 02G.
W71-05612

NET AND SOLAR RADIATION RELATIONS OVER IRRIGATED FIELD CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02D.
W71-05622

BIBLIOGRAPHY ON COTTON IRRIGATION,
L. F. Abell, and C. J. Brouwer.
International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, 1970. 41 p.

Descriptors: *Bibliographies, *Cotton, *Irrigation, *Fertilization, *Economics, Abstracts, Crop production, Crop response, Plant growth, Planting management, Consumptive use, Water requirements, Arid lands, Water conservation.
Identifiers: *Irrigated crops.

Approximately 240 works concerned with consumptive use, or irrigation and water requirements of cotton are listed, some with a brief statement of content. Cotton is a major arid-land crop. Only selected literature published in English, French and German, issued for 1955 to 1969 is included. Bibliographies include masters' theses, books, journals, progress reports, and work done at state agricultural experiment stations. The compilation is divided into sections on irrigation and water requirement, interrelation of irrigation and fertilization, economic aspects of irrigation, bibliographies and reviews on irrigation and water requirement, abstracting journals, and abstracts sections in journals containing pertinent literature. (Popkin-Arizona)
W71-05712

TILLAGE SYSTEM EFFECTS ON WATER USE EFFICIENCY,
Virginia Polytechnic Inst., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W71-05720

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

AN ENVIRONMENTAL SURVEY OF THE LOWER CLEARWATER RIVER,
Idaho Univ., Moscow. Water Resources Research Inst.
C. D. Gordon, D. F. Haber, E. L. Michalson, and J. J. Peebles.
Available from NTIS as PB-197 881, $3.00 in paper copy, $0.95 in microfiche. Idaho University Water Resources Research Institute Information Bulletin No 5, September 1970. 42 p, 3 plate, 4 tab, 8 ref. OWRR Project B-014-IDA (4).

Descriptors: *Water level fluctuations, *Wild rivers, *Reservoir operation, *Recreation, *Environment, Scenery, Wildlife, Fishing, Boating, Wild River Act, Aesthetics.
Identifiers: *Reservoir effects.

The operation of Dworshak Dam, located at the mouth of the North Fork of Idaho's Clearwater River, will result in fluctuations of water level and water quality. A study was made to assess the potential environmental effects on the lower Clearwater River. Beaver, mink, muskrat, otter, weasels and racoons utilize the banks of the river. Upland game such as quail, pheasants, and chukars are present in relatively abundant numbers. Fishing effort on the lower Clearwater is primarily for steelhead and smallmouth bass. There are 33 establishments doing business along the 35.9 mile reach of the lower Clearwater River. Approximately 1.82 billion gallons of water are withdrawn annually from Clearwater River or river subsurface flow to supply the municipal and industrial needs of Lewiston and four small villages. There are a number of archaeological sites along the lower Clearwater River. Six such sites considered to be significant are located between Spalding and Ahsahka. The potential effects of fluctuations of river level and water quality on fisheries, recreation, vegetation, wildlife, aesthetics, and commercial and industrial establishments are briefly discussed. (Knapp-USGS)
W71-05336

FLOOD ROUTING THROUGH STORM DRAINS: PART IV - NUMERICAL COMPUTER METHODS OF SOLUTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-05376

FLOOD FREQUENCY IN ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02E.
W71-05378

PUSHBUTTON CONTROL FOR WATER SYSTEMS MANAGEMENT,
EG and G Inc., Las Vegas, Nev. Development Engineering Dept.; and Engineering Consultants, Inc., Denver, Colo.
L. D. Wilder, and Charles D. Busch.
Paper No 1-246. Agricultural Engineering, p 408-409, July 1970. 1 fig.

Descriptors: *Water management (Applied), *Automatic control, Irrigation, Water distribution (Applied), Telemetry, Waver levels, California, Automation, Arizona, Computer programs, Pilot plants, Canals, Reservoirs, Rivers, Streams.
Identifiers: Servomechanisms, Salt River Project (Ariz), Sacramento Control Center (Calif).

The need to control flow throughout large irrigation projects and their watershed sources, sometimes bridging national boundaries, is bringing automation to water management. Automated systems offer integrated unit control when size precludes regulation by conventional methods. This technology will reach the individual farm level as costs drop and application techniques grow. There are many degrees of sophistication in automation; two methods of supervisory control are now in use. In one the operators do the decision-making based on information provided by the supervisory control system. The second method involved decision-making by a central computer; operation is preprogrammed and the operator's main task is to translate to the computer changing orders for water delivery or emergency situations. A technique long used in industrial engineering for over-all system performance is a pilot plant. One program goal was to evaluate the microdigit water level encoder. It can measure water level in canals, rivers, steams, reservoirs or the position of water control gates, displacement to 0.01 foot accuracy, and gives direct digital conversion. (Jones-Wisconsin)
W71-05400

BIG BLUE RIVER BASIN APPENDIX.
Nebraska Soil and Water Conservation Commission, Lincoln.
For primary bibliographic entry see Field 02E.
W71-05451

EFFECT OF WATERSHED CHARACTERISTICS ON THE TIME PARAMETERS OF RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02A.
W71-05452

COMPARISON OF THE RESULTS OF LABORATORY TESTS WITH DATA OBTAINED BY FIELD OBSERVATIONS OF THE PERFORMANCE OF THE DRAINAGE SYSTEM IN THE SOIL MASSIF ON THE LEFT BANK OF THE BRATSK HYDROELECTRIC PLANT,
For primary bibliographic entry see Field 08D.
W71-05456

FARR V LEACH (REMEDY FOR REFUSAL TO CONSTRUCT DIVERSION DITCH ORDERED BY COUNCIL).
For primary bibliographic entry see Field 06E.
W71-05504

OPPORTUNITIES FOR DEVELOPMENT OF RIVER PORTS ON THE ARKANSAS RIVER WATERWAY SYSTEM, KEOTA, OKLAHOMA.
Garver and Garver, Inc., Little Rock, Ark.
For primary bibliographic entry see Field 06B.
W71-05664

OPPORTUNITIES FOR DEVELOPMENT OF RIVER PORTS ON THE ARKANSAS RIVER WATERWAY SYSTEM, DARDANELLE-RUSSELLVILLE, ARKANSAS.
Garver and Garver, Inc., Little Rock, Ark.
For primary bibliographic entry see Field 06B.
W71-05665

SOME COMMENTS ON LINEAR DECISION RULES AND CHANCE CONSTRAINTS,
Cornell Univ., Ithaca, N.Y. Dept. of Water Resources Engineering.
For primary bibliographic entry see Field 06B.
W71-05675

SENSITIVITY ANALYSIS: A NECESSITY IN WATER PLANNING,
Texas A and M Univ., College Station; Dept. of Industrial Engineering.
For primary bibliographic entry see Field 06A.
W71-05681

OPTIMIZING THE LONG RANGE OPERATION OF THE CALIFORNIA AQUEDUCT BY INCREMENTAL DYNAMIC PROGRAMMING SIMULATION,
California Univ., Berkeley. Operations Research Center.
For primary bibliographic entry see Field 06A.
W71-05682

A COMPARATIVE STUDY OF CRITICAL DROUGHT SIMULATION,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02E.
W71-05683

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS; REPORT OF FLOOD CONTROL SUBPROJECT,
Idaho University, Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W71-05703

4B. Groundwater Management

SUMMARY OF GROUNDWATER HYDROLOGICAL DATA IN MICHIGAN FOR 1969,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 02F.
W71-05351

MODEL FOR FLOW AUGMENTATION ANALYSIS - AN OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W71-05365

GROUNDWATER RESOURCES IN THE EASTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02F.
W71-05374

GROUNDWATER IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W71-05377

ARTIFICIAL GROUNDWATER RECHARGE, WET WALNUT CREEK, CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
J. B. Gillespie, D. W. Green, and S. E. Slagle.
Kansas Water Resources Board Progress Report No 2, January 1970. 28 p, 15 fig, 2 tab, 1 ref, 2 append.

Descriptors: *Artificial recharge, *Pit recharg*Alluvium, *Kansas, Water spreading, On-sit tests, Infiltration, Percolation, Alluvial channe Surface-groundwater relationships, Aquifers.
Identifiers: *Wet Walnut Creek (Kans).

The capability to artificially recharge the alluvi aquifer underlying Wet Walnut Creek valley, cen tral Kansas, was tested at two sites--one an alluvi slope near the edge of the valley and the other shallow tributary channel with ephemeral flow Most of the site-development work is finished ex cept the dam for pond 1 at the tributary-channe site. At the alluvial-slope site, after water pumpe from wells has been ponded for several days, the iri filtration rate is about 0.5 foot per day. The infil trated water is perched above a zone of silty cla from where it percolates to the aquifer. At th tributary-channel site, the infiltration rates var with different channel-bottom conditions. (Knapp USGS)
W71-05379

INTERPRETATION OF ELECTRIC AND GAMMA RAY LOGS IN WATER WELLS,
Gearhart-Owen Industries, Inc., Fort Worth, Tex.
Hubert Guyod.
Well Log Analysts, January-March 1966, p 2-16 13 fig, 48 ref.

Descriptors: *Logging (Recording), *Water wells *Electrical well logging, *Radioactive logging Drilling, Oil industry, Aquifer characteristics Groundwater, Geochemistry, Water quality.
Identifiers: *Well log interpretation, Clean granu lar acquifers, Clayey granular aquifers, Fractured aquifers, Complex aquifers, Dense formations Clay formations, Water salinity estimation, Porosity and permeability estimation, Special log applicability.

A typical inexpensive logging program for water wells consists of a Normal of single-electrode resistivity, the SP and, sometimes, gamma ray measurements. Some of the principles underlying the analysis of these logs are reviewed. The usual logging situations are classified into three groups and simple interpretation procedures are outlined for each. Much useful information is provided by these records, especially when they are supplemented by the bit penetration rate and other data. The logs can solve many common groundwater problems. Those, and the ones that they cannot solve, are reviewed. (Campbell-NWWA)
W71-05688

PUMPING TEST PROCEDURES FOR AQUIFER ANALYSIS,
Michigan Dept. of Public Health, Lansing. Section of Water Supply.
For primary bibliographic entry see Field 02F.
W71-05694

TELEVISION INSPECTION OF A GRAVEL PACK WELL,
Madison Water Utility, Wis.
Zenno A. Gorder.
Journal of the American Water Works Association, Vol 55, No 1, p 31-34, January 1963.

Descriptors: *Water wells, *Municipal wells, Wisconsin.
Identifiers: Closed-circuit television, Gravel pack well, Water well service equipment, Well screen encrustations.

A closed-circuit television system was used to make a visual probe of a problem well for city of LaCrosse, Wisconsin. The resulting diagnosis of condition of well made possible an economic salvaging operation which completely restored well to normal production. It was possible not only to observe ruptured or encrusted areas, but also to estimate degree of efficiency of mechanical brushing or cleaning operations, and whether such procedures had been worthwhile. The city of LaCrosse salvaged a unit well station worth an esti-

mated $27,000.00 at a cost of less than $10,000.00. (Campbell-NWWA)
W71-05695

OIL FIELD TECHNIQUES USEFUL IN WATER WELL DRILLING,
Southern California Water Co., Santa Barbara.
For primary bibliographic entry see Field 08A.
W71-05696

APPLICATION OF ELECTRICAL AND RADIOACTIVE WELL LOGGING TO GROUNDWATER HYDROLOGY,
Geological Survey, Washington, D.C.; and Pennsylvania State Geological Survey, Harrisburg.
E. P. Patten, and G. D. Bennett.
US Geological Survey Water-Supply Paper 1544-D, 1963. 60 p, 11 fig, 23 ref.

Descriptors: *Logging (Recording), *Water wells, Electrical logging, Radioactive logging, Oil industry.
Identifiers: *Resistivity logging, Calibration, Borehole effect, Oil industry interpretation practices, Mud-filled borehole, Water-filled borehole, Porosity and formation factor, *Spontaneous-potential logging, Quantitative Interpretation, Interaquifer flow, *Lithologic interpretations.

This report discusses in considerable detail several problems pertaining to the interpretation of electrical and radioactive well logs in groundwater hydrology. Emphasis has been placed upon situations in which interpretation departs from the practices common in petroleum engineering. Certain interpretive methods of the oil industry are demonstrated to be unsatisfactory for hydrologic purposes, and certain other methods, which have not been commonly used in the oil industry are recommended for use in groundwater hydrology. For all methods, an effort has been made to analyze the interpretive methods in terms of underlying theory, as an understanding of theory is superior to any memorized set of rules or principles in analyzing the data of well logging. (Campbell-NWWA)
W71-05697

OIL WELL DRILLING TECHNOLOGY,
For primary bibliographic entry see Field 08A.
W71-05698

GROUNDWATER HYDROLOGY FOR WATER WELL DRILLING CONTRACTORS,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W71-05699

BIBLIOGRAPHY ON COTTON IRRIGATION,
For primary bibliographic entry see Field 03F.
W71-05712

4C. Effects on Water of Man's Non-Water Activities

A PRELIMINARY ANALYSIS OF THE EFFECTS OF URBANIZATION ON WATER QUALITY,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 05A.
W71-05359

HYDROLOGY OF A SMALL RURAL WATERSHED UNDER SURBURBAN DEVELOPMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Agricultural Engineering.
Kurt Nathan, George H. Nieswand, and Anthony J. Esser.
New Jersey Water Resources Research Institute, New Brunswick Termination Report for period 1966 - 1970, October 1970. 5 p. OWRR Project A-009-NJ (4).

Descriptors: *Rainfall-Runoff relationships, *Small watersheds, Basins, Hydrographs, Runoff, Storm runoff, Surface, Time lag, Time of concentration, Unit hydrographs.

A small rural watershed in New Jersey is being studied for changes in hydrological characteristics during suburban development. Two stream gaging stations and two recording precipitation gages have been established in the area. During the phase covered in this report, regression models for the hydrological properties have been derived for the undeveloped basin. A standard unit hydrograph has also been established for this period. Monitoring of water quality has been initiated recently. The study will be continued during and after development.
W71-05770

ACCESS--ITS EFFECT ON AREA GROWTH AND ENVIRONMENTAL QUALITY.
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 06B.
W71-05776

4D. Watershed Protection

AN EXPERIMENT IN FINITE-DIFFERENCE WATERSHED MODELING,
Montana Univ., Boziman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W71-05701

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

A PRELIMINARY STUDY OF THE RELATIONSHIPS BETWEEN STREAM WATER QUALITY AND WATERSHED CHARACTERISTICS FOR THE TRUCKEE RIVER,
Nevada Univ., Reno. Center for Water Resources Research.
R. J. Morris, C. M. Skau, and V. Vitale.
Available from NTIS as PB-197 883, $3.00 in paper copy, $0.95 in microfiche. Nevada University Desert Research Institute Report, September 1970. 14 p, 3 fig, 4 tab, 9 ref, append. OWRR Project A-033-NEV (1).

Descriptors: *Water quality, *Surface waters, *Watersheds (Basins), *Nevada, *California, Environmental effects, Chemical analysis, Streamflow, Runoff, Topography, Vegetation, Land use, Nitrogen, Phosphates, Boron, Data collections.
Identifiers: *Truckee River Basin (Calif. and Nev).

Water quality along the Truckee River between Lakes Tahoe and Pyramid in northeast California and northwest Nevada was investigated. The six major sampling sites defined five major watersheds along the Truckee River between the outlet dam at Lake Tahoe and the inlet to Pyramid Lake at Nixon. Each watershed was characterized by: (1) area; (2) percentage area logged from 1959 through 1968; (3) percentage area burned from 1959 through 1968; (4) percentage area covered by paved and dirt roads; (5) soil-type percentage for each of eight types common to the area; and (6) vegetation of land-use percentage for each of twelve kinds found in the entire Truckee Watershed. Results of chemical analyses for nitrate and organic nitrogen, phosphate, and boron are tabulated. The overall levels of nitrogen and phosphate are comparatively low from Tahoe Dam to Boynton Lake (just above the Sewage Treatment Plant at Reno). The levels fluctuate around that separating oligotrophic and eutropic conditions, commonly taken as 0.1 mg/liter for nitrogen and 0.01 mg/liter for phosphate. Boron concentrations ranged from .03 mg/liter below verdi to 3.18 mg/liter at Steamboat above Sewage Treatment Plant. (Woodard-USGS)
W71-05338

GC DETERMINATION OF SOLUTES BY MULTIPLE PHASE EQUILIBRATION,
Chevron Oil Field Research Co., La Habra, Calif.
Clayton McAullife.
Chemical Technology, Vol 1, No 1, p 46-51, January 1971. 6 p, 8 fig, 2 tab, 10 ref.

Descriptors: Water pollution sources, *Oily water, *Chemical analysis, Methodology, Test procedures, Carbon, *Solutes, Solubility, Phase diagrams, Chemical properties, Equations, Solvents, Mixing, Solvent extractions, Equilibrium, *Gas chromatography, Laboratory tests, *Pollutant identification, Analytical techniques, Oil wastes.
Identifiers: *Hydrocarbons, Oil pollution.

Multiple phase equilibration is exemplified by the analysis of hydrocarbons dissolved in water. The associated technique and data manipulation, which are detailed, have implications for a diversity of other applications. These include estimation of distribution coefficients, Henry's law constants, vapor pressure, solubility, and several related thermodynamic parameters. The method is based on the demonstration that analysis of only one phase after two successive phase equilibriums gives all necessary data. Water containing the hydrocarbons dissolved from crude oil was analyzed. The first-equilibration chromatogram shows all the hydrocarbons through eight carbon atoms normally found in crude oils. As predicted, the first equilibration removed over 96% of the alkanes, leaving aromatic hydrocarbons and about 10% of the cycloalkanes. The third equilibration chromatogram shows only aromatic hydrocarbons. (Woodard-USGS)
W71-05344

DETERMINATION OF HYDROCARBONS IN SEAWATER EXTRACTS OF CRUDE OIL AND CRUDE OIL FRACTIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W71-05345

FIELD TESTING OF THE IAEA PORTABLE RADIOISOTOPE SEDIMENT-CONCENTRATION GAUGE,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 07B.
W71-05352

A PRELIMINARY ANALYSIS OF THE EFFECTS OF URBANIZATION ON WATER QUALITY,
Regional Science Research Inst., Philadelphia, Pa.
Tatsuhiko Kawashima, Thomas R. Hammer, and Robert E. Coughlin.
Pennsylvania Regional Science Research Institute Working Paper, March 1970. 44 p, 7 fig, 3 tab, 3 append. FWQA Grant No. 16090 DYX.

Descriptors: *Urbanization, *Water quality, *Pennsylvania, *Hydrologic data, *Chemical analysis, Surface waters, Construction, Excavation, Environmental effects, Water properties, Streams, Water analysis, Water pollution, Data collections, Water chemistry, Statistical methods, Regression analysis, Variability, Correlation analysis.
Identifiers: *Urbanization-water quality relationships, *Philadelphia (Penn), *Urban hydrology.

The hydrologic effects of urbanization were studied in the Philadelphia metropolitan area. Land uses, in combination with topographic and other natural features, affect water quality characteristics, streamflow regimen, and channel morphology. Approximately 80 watersheds, 1 to 6 miles in area were sampled. These watersheds vary in development from completely rural to completely urbanized. The water samples were collected from 58 streams during a two-day period in September 1969, at a time when there had been no rainfall in the region for several weeks. Thus, the samples were taken to represent water quality conditions at base flow. The results obtained in the analyses of variance for the categorization by industrial density versus the categorization by residential density are strikingly different. For the industrial density categorization, the null hypothesis (of equality of mean concentrations for the High, Medium and Low densities) was rejected at the 1% level of significance for 10 of the 21 chemicals, and at the 5% level of significance for four additional chemicals. On the other hand, for the categorization by residential density, the null hypothesis was rejected at the 5% level for only one chemical, Si02. (Woodard-USGS)
W71-05359

DETERMINATION OF ORGANIC- AND CARBONATE-CARBON IN FRESHWATER LAKE SEDIMENTS BY A MICROCOMBUSTION PROCEDURE,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. G. Konrad, G. Chesters, and D. R. Keeney.
Journal of Thermal Analysis, Vol 2, p 199-208, 1970. 5 fig, 2 tab, 13 ref.

Descriptors: *Analytical techniques, *Carbon, *Sediments, Lakes, Differential thermal analysis, Wisconsin, Analysis.
Identifiers: *Microcombustion procedure, Wisconsin lakes.

The total, organic, and carbonate carbon are determined in sediments of freshwater lakes by a new microcombustion procedure. The content of organic carbon is obtained by combustion of the sample at 650C and that of total carbon at 950C; the content of carbonate carbon is calculated as the difference. The method was evaluated by differential thermal analysis of 28 samples of sediments from lakes of Wisconsin. In addition, carbonate minerals including aragonite, calcite, dolomite, and their mixtures were analyzed by both procedures. The differential thermal analysis was adapted to identify dolomite. The described method eliminates the difficulties encountered by wet oxidation methods in analyses of sediments enriched in iron, manganese, sulfur, and carbonates. (Wilde-Wisconsin)
W71-05399

TYPE DISTRIBUTION OF COLIFORM BACTERIA IN THE FECES OF WARM-BLOODED ANIMALS,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
E. E. Geldreich, R. H. Bordner, C. B. Huff, H. F. Clark, and P. W. Kabler.
Journal Water Pollution Control Federation, Vol 34, No 3, March 1962, p 295-301. 4 tab, 24 ref.

Descriptors: *Coliforms, *Bacteria, *E. coli, *Farm wastes, Domestic wastes, *Temperature, Cattle, Hog, Sheep, Poultry, Membrane filters, Variability, Water pollution, Surface drainage.
Identifiers: Detection, Enumeration, IMViC, BALB, EC broth procedure, MPN test, Biochemical tests, Correlation.

This investigation examined the reactions of 4512 human, 2339 livestock, and 1896 poultry coliform strains isolated from 43 human, 32 livestock, and 28 poultry fecal samples. The EC procedure showed a 96.3 percent positive correlation and the BALB procedure a 95.3 percent correlation with the coliforms from fecal sources. These findings suggest that the presence of EC or BALB positive coliform strains in water or wastes indicate relatively recent fecal pollution. An occasional shift in percent positive correlation of the elevated temperature test for three human samples during a period of one to three years was noted. The biochemical tests comprising the IMViC typing classification are cumbersome and do not present as close a correlation with fecal origins of the coliform group as other procedures. In view of the excellant reliability of either the EC or BALB test for fecal coliform bacteria, and taking into account the saving in time and effort, the elevated temperature procedure seems to be the method of choice. (White-Iowa State)
W71-05415

THE INFLUENCE OF FEED ADDITIVES ON THE BIOCHEMICAL OXYGEN DEMAND ANALYSIS FOR SWINE WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
John David Ariail.
Master of Science Thesis, 1970. 72 p, 12 fig, 44 ref. OWRR Project A-048-NC (1).

Descriptors: *Farm wastes, *Hogs, *Lagoons, *Biochemical oxygen demand, Chemical oxygen demand, Water properties, Copper, Zinc, Wastes, Lagoons, Manure, Waste water treatment, Waste identification.
Identifiers: *Swine wastes, Swine feces, Chlorotetracycline, Fecal streptococcus.

The influence of feed antibiotic, chlorotetracycline, copper and zinc concentrations and sample dilution upon the standard 5-day biochemical oxygen demand (BOD5) analysis was investigated with swine feces, lagoon influent and lagoon effluent. The swine-growing center utilized for sample collection included a confinement facility with concrete floors that were washed daily and an unaerated overflow lagoon. The data indicated the mean COD/TS ratio for fresh swine feces to be 1.08 grams per gram, the BOD5/TS ratio to have a mean of 0.33 grams per gram, and the VS/TS ratio to have a mean of 0.82. This study indicated that for a 100 lb. hog, the daily COD in the waste was 0.64 pounds; BOD 0.31 pounds; total solids 0.48 pounds and volatile solids 0.33 pounds. The membrane filter technique outlined in Standard Methods for the determination of the fecal streptococcus content of swine wastes was superior to the membrane filter technique utilizing KF broth. (Miner-Iowa State)
W71-05436

DIFFUSIVITY OF OXYGEN IN AQUEOUS ELECTROLYTE SOLUTIONS,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W71-05454

MARINE CHEMICAL POLLUTANTS (METHODS OF STUDY AND RESULTS), (FRENCH),
Centre d'Etudes et de recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, J. Aubert, S. Daniel, and B. Donnier.
English Summaries. Revue Internationale D'Oceanographie Medicale, Vol 17, p 67-77, 1970. 3 tab, 11 ref.

Descriptors: *Industrial wastes, *Chemical wastes, *Toxicity, Marine animals, Marine plants, Food chains, Analytical techniques, Chemical analysis.

A method of analysis for estimating the toxicity of some chemical pollutants to flora and fauna is presented. The method measures the toxicity threshold for four links in the marine biological chain and shows the transmission of the toxin from phytoplankton to zooplankton to fish and finally to small mammifers. Results are given for several different industrial wastes. Kraft cellulose and metallic oxides were found to be the most toxic. (Ensign-PAI)
W71-05501

MICROBIOLOGICAL DETERMINATION OF METHYL-MERCURY,
Aarhus Univ. (Denmark). Inst. of Hygiene.
J. C. Hansen.
Vatten, Vol 4, p 365-368, 1970. 1 tab, 2 fig, 20 ref.

Descriptors: *Microbiology, *Oranic materials, *Ecology, Food chains, Foods, Toxins, Toxicity, Pollutant identification, Water pollution effects.
Identifiers: *Microbiological technique, *Methyl mercury extraction, *Total mercury, *Demethylation.

Inorganic mercury in sediments has been found to methylate to methyl mercury and transfer to water soluble compounds thus allowing the mercury to accumulate in the food chains with the eventuality of harming human beings. A microbiological technique for determining the total content of mercury in organic material of foodstuffs, and the determination of the quantity of organic mercury appearing as methylated mercury is described. (Ensign-PAI)
W71-05505

ISOLATION OF SALMONELLA FROM A POLLUTED MARINE ENVIRONMENT TECHNIQUE AND ENRICHMENT MEDIA,
Aarhus Univ. (Denmark). Inst. of Hygiene.
K. Grunnet, A. Gundstrup, and G. J. Bonde.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 165-177, 1970. 3 tab, 1 fig, 17 ref.

Descriptors: *Bioindicators, *Salmonella, *E. coli, *Coliforms, *Streptococcus.
Identifiers: *Technique, *Media, *Gulf of Aarhus.

Results of experiments over two years of the Salmonella frequency in the polluted Gulf of Aarhus are discussed. An approximate rectilinear relationship is found between the E. coli count and the frequency of Salmonella. Twenty five various serotypes were isolated. The number of isolates belonging in the S. typhimurium and S. paratyphi B groups with different concentrations of E. coli indicated a quicker die-away rate for S. typhimurium than for S. paratyphi B at E. coli counts lower than 300 per 100 ml. Investigations of bottom sediments, aquatic plants, mussels, and fish were also conducted. In very polluted areas salmonellas were detected in samples of all the categories mentioned except fish. (Ensign-PAI)
W71-05516

OCEAN OUTFALL DISPERSION,
Oregon State Univ., Corvallis.
Wesley James, and Fred J. Burgess.
Photogrammetric Engineering, Vol 36, No 12, December 1970, p 1242-1250. 8 fig, 1 tab, 15 ref.
FWPCA Project 16070 ENS.

Descriptors: *Aerial photography, Wastes, Outlets, *Dispersion, Currents, Remote sensing, Pollutant identification.

Evaluations of waste concentrations, dispersion processes, and current patterns by aerial photography are described. This aerial technique has possibilities for a precise method for determining outfall waste concentrations remotely. Data from this method can then be subjected to computer analysis and displays of results generated. This technique may offer more comprehensive results than conventional boat sampling. (Ensign-PAI)
W71-05521

SOME BIOGEOCHEMICAL CONSIDERATIONS ON THE RADIOACTIVE CONTAMINATION OF MARINE BIOTA AND ENVIRONMENTS,
International Laboratory of Marine Radioactivity, Monte Carlo (Monaco).
Rinnosuke Fukai.
Some Biogeochemical Considerations on the Radioactive Contamination of Marine Biota and

Environments, Paper, Pergamon Press, New York, 1969, p 391-394. 1 fig, 1 tab, 7 ref.

Descriptors: *Radioactivity, *Trace elements, *Aquatic life, Water pollution effects, Marine animals, Algae, Mollusks, Fish, Radioactive wastes.
Identifiers: *Biogeochemical data, *Abundance ratios.

Radioactive contamination of marine environments and biota is a link in the biogeochemical process in the sea. The importance of the accumulation of biogeochemical data on the distributions of trace elements in marine biota in relation to the prediction of radioactive contamination is discussed. The reason for obtaining the 'standard abundance' of trace elements for certain groups of marine organisms is explained and the importance of the interpretation of the analytical results and computations of the abundance ratio is mentioned. (Ensign-PAI)
W71-05531

DETECTION OF OIL SLICK POLLUTION ON WATER SURFACES WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif.; and California Univ., Santa Barbara.
J. C. Aukland, W. H. Conway, and N. K. Sanders.
Remote Sensing of Environment, International Symposium, Sixth Proceedings. Ann Arbor, Michigan, October 13-16, 1969, Vol II, p 789-796, 1969. 5 fig, 5 ref.

Descriptors: *Oil wastes, *Remote sensing, *Microwaves, Pollutant identification, Oily water.
Identifiers: Oil slick detection.

There are two mechanisms by which oil slicks on a water surface may be detected. An apparent temperature anomaly is created when oil is present and this local anomaly against the rather uniform sea signifies the detection of oil pollution. An analytical basis for the mechanisms is developed and the results of the experimental verification are presented. It is felt that the primary detection mechanism for thin oil films is the change in sea state due to the presence of oil which sends strong signals to microwave radiometers when winds of 6 knots or more are blowing. The mechanism of direct change in the emissivity of the water surface due to the presence of oil is also considered. These two detection methods are described separately. (Ensign-PAI)
W71-05533

OCEANOGRAPHIC APPLICATIONS OF REMOTE SENSING WITH PASSIVE MICROWAVE TECHNIQUES,
Aerojet General Corp., El Monte, Calif.
A. T. Edgerton, and D. T. Trexler.
Remote Sensing of Environment, International Symposium, Sixth Proceedings, Ann Arbor, Michigan, October 13-16, 1969, Vol II, p 767-788, 1969. 16 fig, 4 ref.

Descriptors: *Oil wastes, *Remote sensing, *Microwaves, Pollutant identification, Temperature, Oily water.
Identifiers: *Scanning radiometers.

A useful tool for determination of sea state, sea ice, and pollution is passive remote sensing in the microwave spectral region. During aerial surveys of the Salton Sea, California and the North Atlantic Ocean, differences in radiometric brightness temperature of the sea surface was readily detected by scanning phased array radiometers. Sea State prediction by microwave brightness temperature, correlated with theoretical models for sea states less than 4 (beaufort). (Ensign-PAI)
W71-05534

MULTISPECTRAL SENSING OF OIL POLLUTION,
Bendix Corp., Ann Arbor. Aerospace Systems Div.; and Michigan Univ., Ann Arbor.
D. S. Lowe, and P. G. Hasell.
Remote Sensing of Environment, International Symposium, Sixth Proceedings, Ann Arbor, Michigan, October 13-16, 1969, Vol II, p 755-765, 1969. 6 fig, 2 ref.

Descriptors: *Oil wastes, *Remote sensing, *Ultraviolet radiation, *Infrared radiation, *Thermal radiation, Pollutant identification.
Identifiers: Multispectral imagery, Santa Barbara (Calif).

The University of Michigan conducted multispectral flights over the Santa Barbara oil slick in early March. Imagery made from selected spectral bands ranging from the ultraviolet through the thermal infrared are presented. Analysis of the data is still in progress. (Ensign-PAI)
W71-05535

OPTICAL (INFRARED AND ULTRAVIOLET-VISUAL) REMOTE SENSING OF POLLUTION OF WATER BODIES,
Michigan Univ., Ann Arbor.
M. R. Holter.
1970 IEEE International Conference on Engineering in the Ocean Environment, Panama City, Florida, September 21-24, 1970, Digest of Technical Papers, p 45-50.

Descriptors: *Remote sensing, *Pollutant identification, *Monitoring, *Water pollution control, *Infrared radiation, *Ultraviolet radiation, Oil wastes, Thermal pollution, Color, Lakes.

Experimental results on developing means of remotely sensing material and thermal pollution in various water bodies are presented. These methods of detection and identification of pollutants are described in detail. The results also suggest possibilities of sensing and calculating wave height and motion, subsurface solid features, bottom depths, turbidity and sediment loads. (Ensign-PAI)
W71-05538

MONITORING CONCEPTS AND REQUIREMENTS IN COASTAL WASTES MANAGEMENT,
National Academy of Engineering, Washington, D.C.; and National Academy of Sciences, Washington, D.C.
R. Keim.
1970 IEEE International Conference on Engineering in the Ocean Environment, Panama City, Florida, September 21-24, 1970, Digest of Technical Papers, p 252.

Descriptors: *Monitoring, *Waste disposal, *Water pollution sources, *Coasts, *Pollutant identification, *Water quality control, Pesticides, Biomass, Trace elements, Heavy metals, Organic wastes.

An evaluation was made of the scientific and engineering requirements for research for further development of our capabilities to protect the marine environment. The National Academy of Engineering and the National Academy of Sciences jointly conducted the investigation. A quantitative guideline to marine receiving water values, and a monitoring program to improve monitoring capabilities is indicated. (Ensign-PAI)
W71-05540

NUTRIENT STUDIES IN HYPER-FERTILIZED ESTUARINE ECOSYSTEMS: I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 05C.
W71-05550

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
John Carroll Univ., Cleveland, Ohio; and Ohio State Univ., Columbus.
Edwin J. Skoch, and N. Wilson Britt.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 325-340, 1969. 16 p, 6 fig, 3 tab, 33 ref. OWRR Project A-008-OHIO (2).

Descriptors: *Sampling, *Bottom sediments, *Lake Erie, *Phosphates, Iron, Organic matter, Chemical analysis, Data collections, Water chemistry, Eutrophication, Nutrients, Path of pollutants, Great Lakes.

Samples of sediment collected in Lake Erie in 1964, 1965, 1966, and on a monthly basis from May, 1967 through November, 1968 were analyzed for total phosphate, iron and organic carbon. Samples were collected by means of an Ekman Dredge and by coring. The cores were sectioned at 2.5 cm intervals and each of the six sections was analyzed. Results of the analyses showed only a slight increase on phosphate since 1964. However all three factors showed a definite increase from May, 1967 through November, 1968. Monthly variation was quite distinct and more severe than the differences between years. The sediment was found to consist of two distinct layers, with the upper 5 cm of sediment usually higher in concentrations of materials than the lower portions. (See also W71-05561) (Knapp-USGS)
W71-05571

COLORIMETRIC METHODS FOR BROMINE,
Illinois State Water Survey, Champaign. Chemistry Section.
For primary bibliographic entry see Field 05F.
W71-05576

GAS CHROMATOGRAPHIC ANALYSIS OF MERCAPTANS, PHENOLS, AND ORGANIC ACIDS IN SURFACE WATERS WITH USE OF PENTAFLUOROBENZYL DERIVATIVES,
Federal Water Quality Administration, Cincinnati, Ohio. Analytical Quality Control Lab.
Fed K. Kawahara.
Environmental Science and Technology, Vol 5, No 3, p 235-239, March 1971. 5 p, 8 fig, 3 tab, 9 ref.

Descriptors: *Gas chromatography, *Organic acids, *Phenols, *Pollutant identification, Organic matter, Water analysis, Monitoring, Sampling, Chemical analysis.
Identifiers: *Mercaptans.

As organic interferences are present in surface water samples, qualitative and quantitative measurements of 0.1 microgram of phenols and (or) organic acids are extremely difficult to make when flame-ionization detection is used in gas-liquid chromatography. By converting the unidentified mercaptans, phenols, and organic acids to pentafluorobenzyl thioethers, ethers, and esters, respectively, subnanogram amounts of these compounds can be separated qualitatively and determined quantitatively by electron capture gas chromatography even with a 95% organic interference. The weak and strong acid fractions obtained from the chloroform extracts of the carbon adsorption samples collected at two field stations were analyzed. (Knapp-USGS)
W71-05577

A DISCUSSION OF THE CHEMICAL CHARACTER OF WATER MIXTURES,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W71-05582

THE DETERMINATION OF LOW LEVELS OF COBALT-60 IN ENVIRONMENTAL WATERS BY LIQUID SCINTILLATION COUNTING,
Geological Survey, Denver, Colo.

H. C. Claassen.
Analytica Chimica Acta, Vol 52, p 229-235, 1970. 7 p, 3 fig, 1 tab, 9 ref.

Descriptors: *Cobalt radioisotopes, *Radiochemical analysis, *Analytical techniques, *Methodology, Water chemistry, Hydrologic aspects, Ion exchange, Sediments, Soils, Soil water, Radioactive waste disposal.
Identifiers: *Cobalt-60, *Scintillation counting, Environmental waters.

Radioactive isotopes of cobalt may be present in waters, fluvial sediments, or soil samples as a result of nuclear detonations, radioactive waste disposal, or cobalt tracer studies. To evaluate movement of radiocobalt in hydrologic systems and to determine the cobalt-60 used in establishing equilibrium constants, distribution coefficients, reaction rates, and sorption equilibria, an outline is developed of methods used and an experimental procedure is described. Cobalt-60 is determined in waters at levels greater than 0.5 pCi per sample; a modification of the method may be used to analyze fluvial sediments and soils. After the cobalt has been separated, first as the hydroxide and then as the thiocyanate complex in methyl isobutyl ketone, it is counted in a liquid scintillation system at 80% efficiency. Separation factors achieved for six isotopes are generally greater than 2,000. The time for an analysis, exclusive of the counting and evaporation operations, is about 2 hr. (Lang-USGS)
W71-05590

MERCURY ADSORPTION OF CHROMIUM OXIDE GELS,
Brunel Univ., Uxbridge (England). Dept. of Chemistry.
F. S. Baker, and K. S. W. Sing.
Nature Physical Science, Vol 229, No 1, p 27, January 4, 1971. 1 p, 7 ref.

Descriptors: *Pollutant identification, *Adsorption, *Chromium, *Heavy metals, *Gels, Investigations, Methodology, Test procedures, Vapor pressure, Laboratory tests, Oxides.
Identifiers: *Mercury, *Mercury adsorption.

With certain chromium oxide gels, a significant amount of mercury vapor adsorption takes place at temperatures around 298 K. During prolonged outgassing of chromium oxide gels at 298 K, the weight of the sample decreased to a minimum (after 2-3 h) and then underwent a slow but uniform rate of increase. The weight change was arrested by the introduction of a small pressure of a permanent gas, but the same rate of increase was restored on further outgassing. When a similar experiment was performed using a microbalance (in place of the spring balance) and a mercury-free adsorption system, no increase in weight could be observed. It seemed likely that the weight increase was due to the adsorption of mercury vapor, which originated from various exposed mercury surfaces in the system (for instance the manometer). To test this hypothesis the mercury vapor pressure was increased three-fold by increasing the temperature of a mercury reservoir; immediately, the rate of increase in weight of the adsorbent was accelerated (initially two-fold). (Woodard-USGS)
W71-05598

MICROCOLUMN CHROMATOGRAPHIC CLEANUP FOR THE ANALYSIS OF PESTICIDES IN WATER,
Geological Survey, Menlo Park, Calif. Water Resources Div.
LeRoy M. Law, and Donald F. Goerlitz.
Journal of the Association of Official Analytical Chemists, Vol 53, No 6, p 1276-1286, November 1970. 11 p, 5 fig, 6 tab, 23 ref.

Descriptors: *Pesticide residues, *Chemical analysis, *Gas chromatography, *Pesticide removal, *Methodology, Gels, Adsorption, Separation techniques, Pesticides, Aldrin, Dieldrin, Endrin, Heptachlor, Agricultural chemicals, Phosphothidate pesticides.
Identifiers: *Pesticide removal (Alumina method), Silica gel method, Florisil method.

Rapid and economical removal of extraneous coextractives from pesticide residue extracts of water is made possible by the use of micro-cleanup columns. Three adsorbents--alumina, silica gel, and Florisil--as well as a variety of solvent systems were investigated. The recovery and cleanup of aldrin, chlordene, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobicycloheptadiene, hexachlorocyclopentadiene, isodrin, lindane, and methoxychlor were satisfactory, using any of the 3 adsorbents. The phosphorothioate pesticides malathion, methyl parathion, and parathion, however, could not be successfully recovered from Florisil when a modified Mills procedure was attempted. The micro-cleanup columns may also be used to perform a preliminary separation of a number of compounds that are difficult to resolve by gas-liquid chromatographic. (Woodard-USGS)
W71-05614

FUNGI ASSOCIATED WITH THE ACTIVATED-SLUDGE PROCESS OF SEWAGE TREATMENT AT THE LEBANON, OHIO, SEWAGE-TREATMENT PLANT,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Research Lab.
For primary bibliographic entry see Field 05D.
W71-05624

SOME ALGAE OF THE UPPER CUYAHOGA RIVER SYSTEM IN OHIO,
Kent State Univ., Ohio. Dept. of Biological Sciences.
Russell G. Rhodes, and Anthony J. Terzis.
The Ohio Journal of Science, Vol 70, No 5, p 295-299, September 1970. 1 fig, 1 tab, 16 ref.

Descriptors: *Algae, Ohio, Chlorophyta, Chrysophyta, Rhodophyta, Cyanophyta, Euglenophyta.
Identifiers: *Cuyahoga River (Ohio), Cladophora, Aphanochaete, Rhizoclonium, Vaucheria, Tribonema, Oscillatoria.

Sixty-four species of algae were found in a qualitative survey made during June and September, 1967, in three tributaries of the Cuyahoga River in Geauga County: West Branch, East Branch, and Tare Creek. Eight species which were collected at the majority of the 14 stations sampled are Cladophora glomerata, Aphanochaete repens, Rhizoclonium hieroglyphicum, Euglena gracilis, Vaucheria sessilis, Tribonema bombycinum, Oscillatoria nigra, and O. limosa. (Little-Battelle)
W71-05629

BANGIA ATROPURPUREA (ROTH) A. IN WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Botany.
Jack Kishler, and Clarence E. Taft.
The Ohio Journal of Science, Vol 70, No 1, p 56-57, January 1970. 1 fig, 5 ref.

Descriptors: *Rhodophyta, *Lake Erie, Ohio, Algae.

Bangia atropurpurea was collected 2 March 1969 at the State Highway Park on the east shore of Marblehead Peninsula, Ottawa County, Ohio. This is the first record of Bangia in western Lake Erie. It appeared as lax red-purple tufts, 3/4 inch long, covering a flagstone on the shoreline where there was an opening in the ice. (Little-Battelle)
W71-05630

THE AUTOMATIC EXTRACTION, IDENTIFICATION AND DETERMINATION OF QUINIZARIN IN HYDROCARBON OILS,
Ministry of Technology, London (England). Lab. of Government Chemist.
K. B. E. Tucker, R. Sawyer, and P. B. Stockwell.
Analyst, Vol 95, p 730-737, August 1970. 8 fig, 4 tab, 8 ref.

Descriptors: *Oil, *Separation techniques, *Spectrophotometry, Detergents, Oil wastes.
Identifiers: *Quinizarin.

Identification and determination of the quinizarin present in oil has been achieved by linking the solvent-extraction system with a flow-through cell of a recording spectrophotometer. Quinizarin is identified by the characteristic spectral pattern and determined by the peak height of the 521 nm peak. (Little-Battelle)
W71-05633

OPTIMUM EXPERIMENTAL CONDITIONS FOR HYDROCARBON TYPE ANALYSIS BY CHROMATOGRAPHY,
Laxminarayan Inst. of Tech., Nagpur (India).
A. K. Sinha, and K. A. Venkatachalam.
Indian Journal of Technology, Vol 8, p 266-268, July 1970. 5 tab, 6 ref.

Descriptors: *Oil, *Aromatic compounds, *Pollutant identification, Chromatography, Fluorescence, Oil wastes, Silica, Gels, Sulfur compounds.
Identifiers: *Fluorescent indicator adsorption, *Hydrocarbons, Olefins, Paraffin, Chemical interference.

The results of a study aimed at establishing the optimum conditions for the fluorescent indicator adsorption analysis of hydrocarbon mixtures, using anthracene as the fluorescent aromatic indicator and nitrogen tetroxide saturated silica gel as the visual marker for olefins are presented. Best resolution is obtained on using dry silica gel. (Little-Battelle)
W71-05634

ANALYSIS OF PLANTS, SOILS AND WATERS FOR NITRATE BY USING AN ION-SELECTIVE ELECTRODE,
New South Wales Dept. of Agriculture (Australia). Biological and Chemical Research Inst.
P. J. Milham, A. S. Awad, R. E. Paull, and J. H. Bull.
Analyst, Vol 95, p 751-757, August 1970. 1 fig, 4 tab, 27 ref.

Descriptors: *Electrode, *Anion exchange, *Freshwater, *Nitrates, Soil analysis, Plants, Instrumentation, Analytical techniques.
Identifiers: Chemical interference.

The use of a commercial anion-exchange electrode permits the rapid determination of nitrate in plant material and in non-saline soils and waters. The buffer used eliminates chloride, nitrite and organic anion interferences. The proposed method gives better recovery and reproducibility than the Devarda method. When the nitrate-nitrogen concentration of non-saline extracts and waters is greater than 2 p.p.m., the method gives results of plus or minus 1 to 3%. Analysis time is extraction time plus 1 minute. Interferences were no problem with the proposed method. (Little-Battelle)
W71-05636

POTENTIOMETRIC NITRATE ANALYSIS: A FLOW-THROUGH ELECTRODE UNIT,
New South Wales Dept. of Agriculture (Australia). Div. of Science Services.
Paul J. Milham.
Analyst, Vol 95, p 758-759, August 1970. 1 fig, 1 tab, 5 ref.

Descriptors: *Nitrates, *Electrodes, *Ion exchange, Instrumentation, Plants, Analytical techniques.

A flow-through electrode unit for use with a liquid ion-exchange nitrate electrode is described. Temperature control to within plus or minus 0.5C at 25C and reproducible stirring of the test medium give a mean coefficient of variation of 0.36 per cent for standards and 0.63 per cent for plant extracts. The average time for each nitrate concentration measurement is halved. (Little-Battelle)

W71-05637

WATER-CO SUB 2 EXCHANGE SET-UP FOR THE ROUTINE 18-OXYGEN ASSAY OF NATURAL WATERS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
Wolfgang Roether.
International Journal of Applied Radiation and Isotopes, Vol 21, p 379-387, 1970. 5 fig, 18 ref.

Descriptors: *Spectrometer, *Radiochemical analysis, Carbon dioxide, Water analysis, Radioisotopes, Oxygen, Analytical techniques.
Identifiers: *Oxygen-18, *Sample preparation, Equilibration.

A new procedure of sample preparation for assaying water for the oxygen-18 isotope is described. It is based on the common principle of equilibrating the water samples with carbon dioxide gas, the isotopic composition of which is then analyzed in the mass spectrometer. However, handling time is reduced to about ten minutes per sample by operating several samples in parallel and by pumping the air from the equilibration vessels through capillary tubes without freezing down the water samples. The capillaries control the loss of water vapour and prevent mixing of the samples. The vessels are shaken during pumping and during the equilibration. The isotopic enrichment caused by the vapour loss was found to be about 0.1 per mille for one ml samples, and it is proportionally smaller for larger samples. For 10 ml water samples at 18 degrees C, the characteristic time for equilibration drops by an order of magnitude between 2 and 3.5 c/s shaking frequency after which it levels off to 18 minutes; the slow step is then the hydration reaction of the dissolved carbon dioxide. The standard reproducibility of sample preparation is better than plus or minus 0.03 per mille and no difference has been detected in isotopic composition to that of samples prepared in the classical manner. (McCann-Battelle)
W71-05640

THE IDENTIFICATION AND MEASUREMENT OF CHLORINATED HYDROCARBON PESTICIDES IN SURFACE WATERS,
Federal Water Pollution Control Administration, Washington, D.C. Div. of Pollution Surveillance.
A. W. Breidenbach, J. J. Lichtenberg, C. F. Henke, D. J. Smith, and J. W. Eichelberger, Jr.
Available from: Analytical Quality Control Laboratory, 1014 Broadway, Cincinnati, Ohio 45202. WP-22, November 1966. 70 p, 38 fig, 2 tab, 71 ref.

Descriptors: *Gas chromatography, *Sampling, *Spectroscopy, Organic pesticides, Carbon, Bottom sediments, Solvent, Measurement, Separation techniques, Endrin, Dieldrin, DDT, Aldrin, Heptachlor, Spectrophotometry, *Chlorinated hydrocarbon pesticides.
Identifiers: *Carbon adsorption, *River water, Sensitivity, FWQA methods, Hexane-benzene, Sample preparation, Chemical interference, Electron capture gas chromatography, Pumps, Lindane, Heptachlor epoxide, Methorychlor, Toxaphene, DDE, Chlordane, Parathion, Methyl parathion, Ovex, Tedion, DDD, Infrared spectrophotometry.

This comprehensive review of the methodology employed by the Surveillance System laboratories of FWPCA for analysis of chlorinated hydrocarbon pesticides includes details on carbon adsorption sampling; sample collection; preparation of samples for gas chromatographic analysis; gas chromatography; infrared spectrophotometry; solvent carbon, and other chemical interferences; sensitivity and specificity of the methods; and pumping systems. Chromatograms, sample calibration curves, infrared spectra from samples, structural formulae, equipment, solvents and reagents, and the general composition of carbon chloroform and carbon alcohol extracts are discussed and illustrated. (Little-Battelle)
W71-05641

DIRECT DETERMINATION OF ELEMENTAL PHOSPHORUS BY GAS-LIQUID CHROMATOGRAPHY,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
R. F. Addison, and R. G. Ackman.
Journal of Chromatography, Vol 47, p 421-426, March 1970. 4 fig, 2 tab, 10 ref.

Descriptors: *Phosphorus, *Gas chromatography, *Flame photometry, Water, Mud, Bioassay, Separation techniques, Chemical analysis.
Identifiers: Gas-liquid chromatography.

A recent problem of pollution of Newfoundland waters by yellow phosphorus led to the development of an alternative method of phosphorus analysis. The method employs gas-liquid chromatography, since (a) phosphorus is relatively low-boiling and volatile, and has been gas chromatographed, and (b) the development of various phosphorus-specific detectors allows the detection of as little as 10 to the -12th power g of this element. As in the classical approach phosphorus is partially isolated by extraction into a suitable organic solvent; a sample of this extract is then subjected to GLC, and the phosphorus response is compared to that of standards. Application of the method to the analysis of water, mud and biological samples is described. Advantages of the method are specificity, sensitivity, and rapidity of analysis over methods currently in use. (McCann-Battelle)
W71-05644

RELIABLE TESTS FOR PESTICIDES NOW AVAILABLE.

Science Journal, Vol 6, No 5, p 19-20, May 1970.

Descriptors: *Test procedures, *Dieldrin, *Fish, *Pesticides toxicity, Minnows, Thermal pollution, Bioassay.
Identifiers: *Tarpon.

A method for determining the toxicity of pesticides to fishes may eliminate inconsistencies in limits on their use. A study by Drs. C. E. Land and D. B. Scba at the University of Miami Rosenstiel School of Marine and Atmospheric Sciences showed that with most test procedures now used, much of the pesticide is rapidly lost from the test solution by vaporization or by fixation to containers. A test procedure for dieldrin has been developed in which these losses do not occur. In this method, the dieldrin is emulsified and the solution is circulated to the apparatus where the fish are exposed under controlled conditions. Exposure of tarpon by this method has shown that blood concentration of a pesticide is not a dependable indicator of its toxicity. Rather environmental conditions cause variations in sensitivity. The gill may be the primary route of pesticide intake in fish. (Little-Battelle)
W71-05645

CURRENT PROGRESS IN THE DETERMINATION OF THE POLYCHLORINATED BIPHENYLS,
California Univ., Berkeley. Inst. of Marine Resources.
R. W. Risebrough, P. Reiche, and H. S. Olcott.
Bulletin of Environmental Contamination and Toxicology, Vol 4, No 4, p 192-201, 1969. 18 ref. NSF Grant GB6362.

Descriptors: *DDT, *Gas chromatography, *Pollutant identification, Spectrometers, Fish, Birds, California.
Identifiers: *Polychlorinated biphenyls, Toxaphene, DDD, Nitration, Saponification, Chemical interference.

The general problem is reviewed of the pervasiveness of pesticide residues in fish and water fowl and conclude that in many cases, DDT and its derivatives have been erroneously identified in place of PCBs. They then describe the characteristics of gas chromatography and chemical methods which enable the analyst to differentiate PCBs from toxaphene, DDT, and DDD. (Little-Battelle)

W71-05646

MAYFLIES OF THE GENUS STENONEMA AS INDICATORS OF WATER QUALITY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Analytical Quality Control Lab.
Philip A. Lewis.
Available from: Analytical Quality Control Laboratory, 1014 Broadway, Cincinnati, Ohio 45202. For presentation at the 17th Annual Meeting of the Midwest Benthological Society, Kentucky Dam Village State Park, Gilbertsville, Kentucky, April 9-11, 1969. 13 p, 3 fig, 1 tab, 13 ref.

Descriptors: *Mayflies, *Bioindicators, *Organic wastes, *Ohio River, Dissolved oxygen, Analytical techniques, Water quality, Water pollution effects, Nutrients.
Identifiers: *Wabash River, *Little Miami River.

As a group, species of the genus Stenonema have not been widely used as pollution indicators because the taxonomy and ecology have not been well defined and the environmental requirements of individual species are yet to be determined. Several basket samples were collected during 1967 from the Ohio River, the Little Miami River, and the Wabash River and analyzed for Stenonema. Analysis of the samples and comparison of the results with those of other authors showed that the definition of the species is incomplete. A thorough description of the Stenonema obtained in the basket samples and their identifying features are included. Data are also given on the numbers of Stenonema collected at the various locations in the rivers. Stenonema integrum was abundant in samples affected by organic wastes. In the Little Miami River, S. pulchellum and S. interpunctatum are able to thrive in spite of organic enrichment because of aerated water. (Little-Battelle)
W71-05647

DETERMINATION OF SUBMICROGRAM QUANTITIES OF MERCURY IN LAKE WATERS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
Yiu-Kee Chau, and Hirohumi Saitoh.
Environmental Science and Technology, Vol 4, No 10, p 839-841, October 1970. 2 fig, 1 tab, 12 ref.

Descriptors: *Spectroscopy, *Heavy metals, Pollutant identification, Separation techniques, Fresh water.
Identifiers: *Mercury, Dithizone extraction, Spectrophotometer, Sample preservation, Atomic absorption spectroscopy.

A simple and sensitive method for the determination of submicrogram amounts of mercury in lake water was developed by combination of concentration by dithizone extraction and gas-phase atomic absorption. The mercury was first extracted by dithizone, back extracted by hydrochloric acid, and then converted to vapor by a reduction-aeration reaction. A sensitivity of 0.008 micrograms per liter (0.008 p.p.b.) was achieved for water analysis. (Little-Battelle)
W71-05648

A SPECTROPOLARIMETRIC TITRIMETRIC METHOD FOR THE DETERMINATION OF CADMIUM, MERCURY, LEAD AND BISMUTH,
Texas A and M Univ., College Station. Dept. of Chemistry.
R. J. Palma, Sr., and K. H. Pearson.
Analytica Chimica Acta, Vol 49, p 497-504, March 1970. 3 fig, 3 tab, 11 ref.

Descriptors: *Volumetric analysis, *Ions, *Pollutant identification, Chelation, Hydrogen-ion concentration, Heavy metals.
Identifiers: *Cadmium, *Lead, *Bismuth, *Spectropolarimetric titrimetry, *Mercury, Polarimeter, Propylenediaminetetraacetric acid.

Spectropolarimetric methods of analyses of cadmium (II), lead (II) and bismuth (III) were developed, based on the stereospecific ligand, D- (-)-I,2-propylenediaminetetraacetic acid (D (-)PDTA). The optical rotation of the solution was monitored with a photoelectric polarimeter to determine the end-point of the titration. The effects of pH, wavelength, and dilution are discussed and the optimum conditions for the determination of each metal are established. The range of accurate analyses at 365 nm was 0.1 minus 0.001 m for cadmium (II), and 0.1 minus 0.0001 m for lead (II), mercury (II), and bismuth (III). The range of the average deviations from visual cholometry for the four metals titrated was 0.05 minus 0.29%. (Little-Battelle)
W71-05649

ANALYSIS OF FROZEN AQUEOUS SOLUTIONS BY SPARK SOURCE MASS SPECTROSCOPY,
Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
E. B. Owens.
Analytical Letters, Vol 3, No 5, p 223-234, 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Spectroscopy, *Aqueous solutions, *Pollutant identification, *Heavy metals, Copper, Iron, Chromium, Potassium, Chlorine.
Identifiers: *Spark-source mass spectroscopy, Indium, Zinc, Nickel.

Aqueous solutions containing metals and other elements dissolved by acids were analyzed with a spark source mass spectrograph sparking to the frozen samples. The elements investigated were In, Zn, Cu, Ni, Fe, Cr, K, Cl. The minimum detection limit obtained from a 10 to the -8th power coulomb exposure is about 5 x 0.0000001 M solution concentration. Analytical precision of 8 to 30% relative is achieved through use of an internal standard. (Little-Battelle)
W71-05650

ENVIRONMENTAL MERCURY: RAPID DETERMINATION IN WATER AT NANOGRAM LEVELS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
Robert W. April, and David N. Hume.
Science, Vol 170, No 3960, p 849-850, November 20, 1970. 2 fig, 2 ref.

Descriptors: *Spectrophotometry, *Pollutant identification, Heavy metals, Seawater, Massachusetts, Sewage.
Identifiers: *Mercury, *Plasma emission spectroscopy, Radiofrequency helium plasma, Charles River (Massachusetts).

Mercury compounds and free mercury are determined by emission spectrophotometry in a radiofrequency helium plasma. The method is simple, rapid, directly applicable to environmental water samples, and subject to few interferences. The useful working range is 10 nanograms to 10 micrograms, or 1 part per billion to 1 part per million in 10 milliliters of sample. The limit of detection is about 2 nanograms. (Little-Battelle)
W71-05651

A ROTATING SAMPLING ARM--AN AID TO AUTOMATIC ANALYSIS OR SAMPLING,
Upper Tame Main Drainage Authority, Birmingham (England).
J. Phillips.
Water Research, Vol 3, p 907-909, 1969. 2 fig, 1 ref.

Descriptors: *Chemical oxygen demand, *Sampling, *Automation, *Mechanical equipment.

The sampling arm developed carried a glass sampling probe which on an initial signal drops into the sample for uptake of the required aliquot. The next signal causes the arm to life the probe out of the sample, rotate it to a set position above a receiving vessel and drop the probe into the vessel. After discharge of the sample that is taken the arm lifts and returns to its original position. The vertical movement of the arms is controlled by a solenoid attached to the pivoted arm which lifts when the solenoid is energized and drops as the solenoid is de-energized. Rotation of the arm is by means of a synchronous motor which will function in both forward and reverse directions. (Little-Battelle)
W71-05652

THE COURSE OF BIODEGRADATION OF ANIONIC DETERGENTS BY ANALYSES FOR CARBON, METHYLENE BLUE ACTIVE SUBSTANCE AND SULFATE ION,
Department of Agriculture, Philadelphia, Pa. Eastern Utilization Research and Development Div.
For primary bibliographic entry see Field 05B.
W71-05653

ANALYSIS OF TIME-VARIANT BEHAVIOR OF WATER CHEMISTRY,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 02K.
W71-05705

RECOVERY, SEPARATION, AND IDENTIFICATION OF PHENOLIC COMPOUNDS FROM POLLUTED WATERS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Sciences.
Samuel D. Faust, Stutz Hansjakob, Osman M. Aly, and Peter W. Anderson.
Available from NTIS as PB-198 030, $3.00 in paper copy, $0.95 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, Final Report, January 1971. 56 p, 8 tab, 5 fig, 16 ref. OWRR Project A-020-NJ (1).

Descriptors: *Phenol, *Industrial wastes, *Pollutant identification, Taste, Odor, Water pollution sources, *Chemical analysis, Rivers, Groundwater.

A four-year research program was completed wherein the rivers and groundwaters of New Jersey were sampled and tested for phenolic compounds. These chemicals originated in industrial manufacturing processes and are discharged into rivers and groundwaters through the waste waters. Over 500 samples in this four year program were collected from nearly all of the rivers in New Jersey. Several samples were drawn from the deep wells in the Camden, New Jersey, area. Approximately 71% of the samples contained these phenols in quantities that exceeded the potable water quality standard of 1 part per billion established by the New Jersey Environmental Protection Agency. Also, extensive chemical detective work led to the identification of several phenols in the Raritan River and Assunpink Creek. A chemical test was discovered for the detection and identification of phenols that originate in industrial waste waters. Phenols are a water pollutant in that they have the chemical property of imparting tastes and odor to drinking water. These tastes and odors are often described as being 'medicinal', 'chemical', 'aromatic', and 'iodine'. This new chemical test will help pollution abatement officials to trace this type of pollution to its source.
W71-05768

MONITORING OF THE MARINE ENVIRONMENT FOR WASTE COMPONENTS AND FOR EFFECTS OF THE INTRODUCED WASTES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
William B. Davis.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p II 1-II 41. 4 tab, 183 ref.

Descriptors: *Wastes, *Water pollution effec
*Aquatic environment, *Monitoring, Oxygen
mand, Nutrients, Chemical, Radioactivity, Therm
pollution, Bacteria, Pollutant identification.
Identifiers: Monitoring systems, Research needs.s

A monitoring program is a necessary part of effe
tive pollution control. Water pollution is a mu
variate condition which necessitates recognitio
and confirmation of a contaminated condition n
chemists, biologists and engineers with the lea
possible tests in order to initiate steps towa
prevention. Recognition of changing conditio
requires knowledge of the normal water mov
ments and properties. Analytical proceedures,
strumentation, and modeling for exact definition
the state of flux for a precise location and time
necessary. The complete spectrum of chemic
substances and a multi-species ecosystem should
considered when monitoring pollutants in an estu
ry. The capability for measurement of any pollut
and a method for rapid location of its source m
be made possible and practical. These possibiliti
along with additional research needs are discusse
(See also W71-05787) (Ensign-PAI)
W71-05789

WASTE DISCHARGE MONITORING,
California Univ., Berkeley. Div. of Hydraulic a
Sanitary Engineering.
Erman A. Pearson.
Background Papers on Coastal Wastes Manag
ment, prepared for National Academy of Scienc
Committee on Oceanography and the Nation
Academy of Engineering Committee of Ocean E
gineering, Wash, DC, Vol 1, 1969, p IV 1-IV 14
fig, 3 tab, 1 ref.

Descriptors: *Wastes, *Monitoring, *Water poll
tion sources, *Water pollution control.
Identifiers: Methods, Metering, Sampling.

Reasonably accurate information on all was
sources and the variability in magnitude of the po
lutant characteristics of the sources are necessa
for effective control of water pollution. Quantiti
assessment of the waste streams, where pollutan
originate, is the most effective way of assessing t
trend of pollutant concentrations. Quantitati
data for both municipal and industrial was
discharge characteristics is needed. Statistic
descriptions of the pollutant mass emission rates
waste streams are indicated. The methods
sampling, metering, and analysis of pollutants
these waste streams and the justification for obtai
ing this data are presented. (See also W71-0578
(Ensign-PAI)
W71-05791

5B. Sources of Pollution

**A PRELIMINARY STUDY OF THE RELATIO
SHIPS BETWEEN STREAM WATER QUALIT
AND WATERSHED CHARACTERISTICS FO
THE TRUCKEE RIVER,**
Nevada Univ., Reno. Center for Water Resourc
Research.
For primary bibliographic entry see Field 05A.
W71-05338

**MANAGEMENT OF AGRICULTURA
RESOURCES TO MINIMIZE POLLUTION O
NATURAL WATERS,**
Iowa State Univ., Ames. Dept. of Agricultural E
gineering.
For primary bibliographic entry see Field 05G.
W71-05341

**SLUDGE DUMPING IN THE THAMES ESTU
RY,**
Ministry of Agriculture, Fisheries and Foods, Burn
ham-on-Crouch (England). Fisheries Lab.
R. G. J. Shelton.
Marine Pollution Bulletin, Vol 2, No 2, p 24-27
February 1971. 4 p, 8 fig, 4 ref.

Descriptors: *Water pollution sources, *Sludge disposal, Wastes, Estuaries, Investigations, Sampling, Sediments, Methodology, Evaluation, Dissolved oxygen, Organic matter, Benthic fauna, Bethos, Marine animals, *Waste disposal, Water pollution effects.
Identifiers: *Thames estuary (England).

The dumping of sludge produced at the main London sewage works at Becton and Crossness has continued in the outer Thames Estuary since 1887, and at the present time more than five million tons (wet weight) of digested sewage sludge is dumped each year in the Barrow Deep. The water content of London sludge is variable but is normally over 96%. The objectives of this study, which is a preliminary report, were to determine to what extent the effects of sludge dumping could be detected by examination of the sediments and bottom fauna of the outer Thames Estuary. Samples were collected at 66 stations extending from Sea Reach, through the Barrow, Black and Middle Deeps to beyond the East Swin. The main concentration of organic matter (up to 5.7%) was in Sea Reach. Polychaetes were found at all stations, being generally more numerous in the Black Deep than at stations in the Barrow and Middle Deeps. (Woodard-USGS)
W71-05342

DETERMINATION OF HYDROCARBONS IN SEAWATER EXTRACTS OF CRUDE OIL AND CRUDE OIL FRACTIONS,
Woods Hole Oceanographic Institution, Mass.
D. B. Boylan, and B. W. Tripp.
Nature, Vol 230, No 5288, p 44-47, March 5, 1971. 4 p, 4 fig, 3 tab, 11 ref.

Descriptors: *Pollutant identification, *Water pollution sources, *Oily water, Sea water, Solubility, Laboratory tests, Test procedures, *Gas chromatography, Oil, Evaluation, Water analysis, Oil wastes, Chemical analysis, *Spectroscopy.
Identifiers: Oil pollution, Mass spectroscopy.

Major components of crude oil and kerosene were isolated, identified, and quantitatively determined in seawater samples. Oil samples were mixed with filtered seawater in different ways to simulate natural process of contact between oil and water. The processed samples were transferred to separatory funnels and allowed to stand for 2 hr before the two phases were separated. The aqueous phase was then extracted four times with doubly distilled pentane. The evaporated residue from the pentane extract was chromatographed on a Varian Aerograph-1200 gas chromatograph interfaced to a CEC-104 mass spectrometer. Component structures were assigned on the basis of mass spectra, boiling point comparisons and ultraviolet spectra. Concentration of dissolved compounds was determined by planimetry of gas chromatographic peaks. In each oil or kerosene studied, significant differences in relative amounts of naphthalene compounds were observed. (Woodard-USGS)
W71-05345

MARINE POLLUTION PROBLEMS IN JAMAICA,
University of the West Indies, Kingston (Jamaica). Dept. of Zoology.
Barry A. Wade.
Marine Pollution Bulletin, Vol 2, No 2, p 29-30, February 1971. 2 p, 1 fig.

Descriptors: *Water pollution sources, *Sewage effluents, *Sewage disposal, *Harbors, Oceans, Water pollution, Organic matter, Eutrophication, Wastes, Recreation, Fishkill, Bacteria, Coliforms.
Identifiers: *Kingston (Jamaica), Untreated sewage.

There is no master sewage scheme to dispose of domestic wastes for Kingston's (Jamaica) population of nearly half-a-million people. There is an almost total dependence on cesspits. Only the commercial, industrial and parts of the low income areas of the city situated near the waterfront have any central disposal; this accounts for 5 million gallons of only primary treated sewage disposed into Kingston Harbor each day. In addition, numerous gulleys and drains also discharge organic wastes into the harbor. As a result, the entire northern shore has a bacterial coliform count which indicates that the water may be a potential health hazard for bathers, and other users of the sea-front. Furthermore, the high nutrient content of the water causes eutrophication and red tide blooms and large-scale fish-kills are occurring. The government has recently formed a special committee to conduct a monitoring program of Kingston Harbor in order to determine how far its pollution has advanced and to advise on what corrective measures should be taken in order to reverse the trend. (Woodard-USGS)
W71-05349

A QUANTITATIVE ANALYSIS OF THE EFFECTS OF BATHERS IN RECREATIONAL WATER QUALITY,
Tufts Univ., Medford, Mass. Dept. of Civil Engineering; and New York Sta Rochester.
N. B. Hanes, and A. J. Fossa.
Paper HA-9 presented at the 5th International Water Pollution Research Conference, July-August 1970, p HA-9/1-HA-9/9. 9 p, 9 tab, 14 ref. PHS Training Grant EH-69-647-C.

Descriptors: *Water quality, *Surface waters, *Recreation facilities, *Swimming, *Water supply, Testing, Test procedures, Water pollution, Analysis, Analytical techniques, Chemical analysis, Bacteria, Coliforms, Turbidity, Ammonia, Chlorides.

The effect of recreational uses of water quality was studied using a total of 64 subjects (38 male and 26 female) ages 6 to 38, and a plastic lined 3400-gallon swimming pool, 15 feet long by 10 feet wide and 3.5 feet deep. To reduce spillage, a water depth of 30 inches was used which provided an experimental capacity of 2700 gallons. The pool was filled weekly with water and allowed to stand until the chlorine residual dissipated. Except during periods of bathing, the pool water was filtered continuously through two Diatomaceous Earth spin filters with a combined capacity of 4500 gallons per hour. During an experiment, bathers swam for two consecutive fifteen minute periods. Samples were taken at two stations in the water (six to eight inches below the surface) and one station on the pool wall (also below the water surface). These samples were analyzed for total bacteria, Coliform, Enterococci, Pseudomonas aeruginosa, Turbidity, pH, Ammonia Nitrogen, and Chlorides. The results of this study are tabulated and clearly demonstrate that swimmers have a considerable influence on the bacterial and chemical quality of water. (Woodard-USGS)
W71-05366

LAKES: THE VALUE OF RECENT RESEARCH TO MEASURE EUTROPHICATION AND TO INDICATE POSSIBLE CAUSES,
Marine Dept., Rotorua (New Zealand). Fisheries Research Division.
G. R. Fish.
Journal of Hydrology (New Zealand), Vol 8, No 2, p 77-85, 1969. 1 fig, 2 tab, 18 ref.

Descriptors: *Lakes, *Eutrophication, Nutrients, Industrial wastes, Sewage effluents, Agriculture, Runoff, Nitrates, Phosphates, Ammonium salts, Thermal water, Flooding, Fertilization, Sampling, Flow rates, Rainfall, Evaporation, Springs, Biomass, Nitrogen fixation, Denitrification, Geysers.
Identifiers: Lake Rotorua (New Zealand).

Excessive plant growth in lakes and rivers is probably the most serious impediment to economic use of fresh waters throughout the world. The growth results from artificial enhancement of the fertility of the water, and this eutrophication is caused by large amounts of nutrient salts draining from highly developed catchments. Industrial and sewage effluents probably provide the most important sources of nutrient salts in the continents of America and Europe. Research begun in 1967 to study the physical, chemical, and biological features of Lake Rotorua (New Zealand) disclosed that the water and nutrient budget, calculated for the year June 1967-1968, disclosed that although sewage is an important source of eutrophication, run-off from agricultural land is probably a more important source of plant-fertilizing salts such as nitrate and phosphate. Certain thermal effluents (geysers) provide the major source of ammonium salts. Data collected during a flash flood on a small experimental catchment showed brief but greatly increased leaching of salts from the pastures. The conclusion that agricultural development is the most important cause of eutrophication of local lakes is supported by results published by workers in other parts of New Zealand. (Jones-Wisconsin)
W71-05401

A TECHNICAL ASSESSMENT OF CURRENT WATER QUALITY CONDITIONS AND FACTORS AFFECTING WATER QUALITY IN THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Norbert A. Jaworski, Donald W. Lear, Jr., and Johan A. Aalto.
Water quality status report. CTSL Technical Report No 5, MAR, March 1969. 55 p, 17 fig, 6 tab, 21 ref.

Descriptors: *Biochemical oxygen demand, *Nutrients, *Dissolved oxygen, *Algae, Coliforms, Eutrophication (Phytoplankton), Estuaries, Water pollution sources, Water pollution effects, Nitrogen, Coliforms, Water quality.
Identifiers: *Potomac River estuary, Nutrient-phytoplankton relationships.

Water quality conditions in the Upper Potomac Estuary including BOD, dissolved oxygen, phosphorus, nitrogen and coliform densities, are presented and discussed. The sources and relationships of nutrients to algal standing crop are studied. Major sources of carbonaceous and nitrogenous oxygen demand as well as the demand from the algal standing crop on dissolved oxygen are evaluated. (Aalto-Chesapeake Technical Support Laboratory)
W71-05407

SANITARY BACTERIOLOGY OF THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05C.
W71-05408

WATER QUALITY AND WASTE WATER LOADINGS UPPER POTOMAC ESTUARY DURING 1969,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Norbert A. Jaworski.
Water quality status report. CTSL Technical Report No 27, MAR, Nov 1969. 62 p, 14 fig, 9 tab, 4 ref, append.

Descriptors: *Biochemical oxygen demand, *Phosphorus, *Nitrogen, *Coliforms, *Dissolved oxygen, Estuaries, Algae, Water pollution sources, Water pollution effects, Water quality.
Identifiers: *Potomac River estuary.

For the first eight months of 1969, about 55% of the BOD entering the Potomac Estuary from all major sources was from waste water discharges in the Washington area. Also these discharges contributed 86% of the total phosphorus and 66% of the total nitrogen. Total carbon entering the estuary from all sources was mainly in the form of inorganic carbon. Dissolved oxygen levels were measured. As a result of increased chlorination of the waste water treatment facility effluents, coliform

densities were significantly lower. To facilitate the determination of waste water discharge loadings, the estuary was zoned into fifteen mile reaches. Maximum waste discharge loadings for BOD (organic carbon), nitrogen and phosphorus have been determined for Zone I in the Washington area. Preliminary estimates of loadings have been established for Zone II downstream from the Washington area. (Aalto-Chesapeake Technical Support Laboratory)
W71-05409

POTOMAC-PISCATAWAY DYE RELEASES AND WASTE WATER ASSIMILATION STUDIES,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Norbert A. Jaworski, and James H. Johnson, Jr.
Special study conducted to evaluate effluent discharge effects in the Piscataway Creek tidal embayment. CTSL Technical Report No 19, MAR, FWQA, Dec 1969. 122 p, 54 fig, 27 tab, 8 ref, 3 append.

Descriptors: Water pollution effects, *Mathematical models, *Path of pollutants, Dye releases, Estuaries, Water pollution sources, *Waste assimulative capacity, Water quality.
Identifiers: *Piscataway Creek Embayment, *Potomac River estuary, Piscataway Waste water Treatment Plant.

Dye releases were made in the main channel of the Potomac Estuary and in the upper portion of the Piscataway embayment to simulate the movement of the effluents discharged from the Piscataway Waste Water Treatment Plant. Based on the data from the releases and the results from simulations by mathematical models of the upper Estuary and the Piscataway embayment it is concluded that the most advantageous waste water discharge location is on the main channel of the Potomac Estuary. (Aalto-Chesapeake Technical Support Laboratory)
W71-05410

UPPER POTOMAC RIVER BASIN WATER QUALITY ASSESSMENT,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Johan A. Aalto, Leo J. Clark, and Norbert A. Jaworski.
Status report. CTSL Technical Report No 17, MAR, November 1969. 129 p, 33 fig, 34 tab, 8 ref, append.

Descriptors: Water pollution sources, Water pollution effects, *Coliforms, *E. Coli, *Biochemical oxygen demand, *Dissolved oxygen, *Mine drainage, *Thermal pollution, *Nutrients, Rivers, Water quality.
Identifiers: *Potomac River Basin.

Pollution conditions in the upper Potomac basin are investigated and their contributions to water quality problems of the Potomac Estuary are evaluated. Bacteriological data and coliform and fecal coliform densities are given. DO and BOD concentrations are examined. Water samples are analyzed for pesticide determinations. Major sources of thermal wastes are presented. The tributary streams producing most of the acid from mine drainage and major sources of nutrients are listed. (Aalto-Chesapeake Technical Support Laboratory)
W71-05411

CONTROL OF WATER POLLUTION FROM SOUTHWESTERN CATTLE FEEDLOTS,
Texas Tech Univ., Lubbock. Water Resources Research Center.
For primary bibliographic entry see Field 05D.
W71-05412

ANIMAL WASTES - A NATIONAL PROBLEM,
Cornell Univ., Ithaca. Dept. of Agriculture; and Cornell Univ., Ithaca. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-05420

AGRICULTURE AND THE PREVENTION OF RIVER POLLUTION, AS EXPERIENCED IN THE WEST OF SCOTLAND,
Clyde River Purification Board (Scotland).
F. J. Little.
Journal Proceedings of the Institute of Sewage Purification, 1966, p 452-454. 1 tab, 7 ref.

Descriptors: *Farm wastes, *Water pollution sources, Effluents, Cattle, Poultry, Hogs, Sheep, Rivers, Silage, Biological treatment, Waste water treatment.
Identifiers: *Scotland, Dairy cattle, Silage liquor, Sheep dips, Remedial action, Extended aeration, Rivers (Scotland) Act 1951.

Different types of polluting effluents in Scotland are discussed, and what action has been taken to prevent river pollution. Agricultural effluents can be divided into three groups - animal, vegetable, and chemical, of which animal effluents pose the greatest problem. Dairy waste is the most prevalent effluent, while beef, sheep, hogs and poultry play a minor role. Biological treatment here is in the experimental stage. Silage liquor has presented a problem due to its high BOD. Chemical effluents result from the use of sheep dips, herbicides, fertilizers, bactericides, and dairy detergents. Problems arise from careless use of equipment rather than intentional discharges. The problems of disposal are complex and require the patience and understanding of both farmer and the general public. A discussion follows the paper. (White-Iowa State)
W71-05421

AGRICULTURAL PRACTICES AND WATER QUALITY.

Edited by T. L. Willrich and G. E. Smith, Iowa State University Press, Ames, 1970. 415 p.

Descriptors: *Farm wastes, *Water pollution sources, Waste water treatment, Aerobic conditions, Anaerobic conditions, Oxidation lagoons, *Path of pollutants, Waste disposal, Waste water disposal, Nutrients, Pesticides, Sediments, *Water quality.
Identifiers: *Agricultural pollution.

The chapters of this book are a result of a conference, The Role of Agriculture in Clean Water, held at Iowa State University, Ames, Iowa, November 18-20, 1969. Categories include: Sediment as a Water Pollutant, Plant Nutrients as Water Pollutants, Pesticides as Water Pollutants, Animal Wastes as Water Pollutants, Agricultural Pollution Implications, and Agriculture's Involvement in Polluted and Clean Water. (See also W71-05438 thru W71-05442)
W71-05437

LIVESTOCK OPERATIONS AND FIELD-SPREAD MANURE AS SOURCES OF POLLUTANTS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. R. Miner, and T. L. Willrich.
In: Agricultural Practices and Water Quality, 1970, Iowa State University Press, p 231-240. 2 tab, 25 ref.

Descriptors: *Pollutants, *Confinement pens, Farm wastes, Biochemical oxygen demand, Chemical oxygen demand, Runoff, Liquid wastes, Groundwater, Lagoons, Water pollution sources, Water pollution, Waste water treatment.
Identifiers: *Pollution characteristics, Lagoon effluent, Feedlot runoff.

This paper deals with the pollution potential from animal wastes. The pollution characteristics of animal wastes and the surface water and groundwater pollution potentials are discussed. Runoff is a primary mode of transportation of the waste to the water supplies. This pollution can be minimize through proper management. (See also W7 05437) (Christenbury-Iowa State)
W71-05438

MANURE DECOMPOSITION AND FATE O BREAKDOWN PRODUCTS IN SOIL,
Department of Agriculture, Lincoln, Neb.; an Iowa State Univ., Ames.
T. M. McCalla, L. R. Frederick, and G. L. Palmer.
In: Agricultural Practices and Water Quality, 197 Iowa State University Press, p 241-255. 2 fig, 1 tab, 38 ref.

Descriptors: Farm wastes, Disposal, Fertilizer Aerobic conditions, Anaerobic condition Microorganisms, Storage, Water pollution source Waste water treatment.
Identifiers: Fertilizer value, Composition, Break down, Decomposition.

This paper discusses the composition of anim manure. Fresh manure contains from 30 to 80 water. The rest of the constituents in manure an inorganic and organic solids, liquids, and gase Manure contains all the inorganic nutrients needed by plants. Roughly, 90% of the dry matter i manure is organic waste material from anima digestion of feeds. The microbial population c animal waste is composed mainly of bacteria, fungi actinomycetes, and protozoa. Significant decom position of manure may occur in the feedlot if a lowed to remain there long enough. Further decomposition occurs when applied to the soi Manure should be plowed under to minimize l loss. Huge quantities of animal waste applied to th land may result in accumulation of some organi and inorganic constituents in concentrations tha may become toxic to plants, particularly under anaerobic decomposition conditions. (See als W71-05437) (Christenbury-Iowa State)
W71-05439

MANURE TRANSFORMATIONS AND FATE O DECOMPOSITION PRODUCTS IN WATER,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
Ross E. McKinney.
In: Agricultural Practices and Water Quality, 197 Iowa State University Press, p 256-264. 15 ref.

Descriptors: *Anaerobic conditions, *Aerobic con ditions, *Lagoons, Farm wastes, Odor, Aqueou solutions, Disposal, Microorganisms, Desig criteria, Water pollution sources, Waste wate treatment.
Identifiers: Oxidation ditch, Anaerobic lagoons Aerated lagoons, Oxidation ponds.

With regard to aqueous treatment systems fo animal manure, it is apparent that aqueous treat ment systems are not desirable for animal waste ex cept in special situations. The concentrated anima wastes are not normally mixed with water and ca be handled best as solid wastes. Chicken house have been designed to handle the waste as solids However, confined hog houses have too much fluid manure for handling as solids. The oxidation ditch has proven satisfactory for handling hog waste Treated hog manure must be returned to the soi for final disposal. The soil is the ultimate accepto of all animal wastes. There is no reason that the ox idation ditch should not be satisfactory for treating cattle manure. The biological treatment will reduce only a small fraction of the total solids of the manure. This treatment destroys the obnoxious qualities and results in a material that is more satisfactory for disposal. (See also W71-05437 (Christenbury-Iowa State)
W71-05440

DISEASE TRANSMISSION OF WATER-BORNE ORGANISMS OF ANIMAL ORIGIN,
Minnesota Univ., St. Paul. Dept. of Veterinary Microbiology and Public Health.
Stanley L. Diesch.

In: Agricultural Practices and Water Quality, 1970, Iowa State University Press, p 265-285. 93 ref.

Descriptors: *Diseases, *Animal diseases, *Animal pathology, *Human diseases, Farm wastes, Pathogenic bacteria, Pathogenic fungi, Pathology, Viruses, Water transfer, Human pathology, Parasitism, Water pollution sources.
Identifiers: Disease transmission, Rickettsia.

An effort is made to indicate the potential epidemiologic significance based on the variability of the resistant characteristics of various kinds of pathogenic organisms and their potential for water transmission. The historical implication of water and disease is briefly reviewed. The current problems of disease transmission related to water is discussed. To document water's role as a vehicle in disease transmission, information gathered from a literature review was used. Specific disease entities are grouped by classification based on etiology of the causative organisms. Infectious diseases of animals and man caused by bacteria, Rickettsia, viruses, fungi, and parasitic organisms are discussed. (See also W71-05437) (Christenbury-Iowa State)
W71-05441

ANIMAL WASTE MANAGEMENT TO MINIMIZE POLLUTION,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
J. A. Moore.
In: Agricultural Practices and Water Quality, 1970, Iowa State University Press, p 286-297. 35 ref.

Descriptors: *Farm wastes, *Management, Aerobic conditions, Anaerobic conditions, Disposal, Tertiary treatment, Pollutants, Liquid wastes, Lagoons, Sedimentation, Trickling filters, Water pollution sources, Waste water treatment.
Identifiers: Flushing gutters, Composting, Aerated lagoons, Oxidation ponds, Slatted floors, Screening.

Management of animal waste can be broken down into four separate functions: collection, storage, treatment, and utilization or disposal. The options available for each of these functions are described. Collection is divided into two types: wet or dry. The remaining management functions depend on the collection type used. Three basic treatment processes developed by the Civil Service Engineers that apply to animal manure are described. These are: Primary treatment, Secondary treatment, and Tertiary treatment. Almost all of the utilization and disposal of animal manures will be through land application. The disposal systems that have been proven are presented. These include liquid manure disposal as well as solid manure disposal. (See also W71-05437) (Christenbury-Iowa State)
W71-05442

SORPTION AND DESORPTION OF CHLORINATED HYDROCARBON PESTICIDES BY CLAY MINERALS,
Missouri Univ., Rolla. Dept. of Civil Engineering.
Cheng Sun Liao.
M Sc Thesis, 1969. 147 p, 44 fig, 34 tab, 67 ref, 4 append. OWRR Project A-016-MO (2).

Descriptors: *Pesticides, *Adsorption, *Clay minerals, Path of pollutants, Pesticide kinetics, DDT, Dieldrin, Heptachlor, Illite, Kaolinite, Montmorillonite, Equilibrium, Chlorinated hydrocarbon pesticides, Sorption, Aqueous solutions, Soil chemistry.
Identifiers: *Pesticide adsorption (Clays).

The sorption and desorption of chlorinated hydrocarbon pesticides by clay minerals were studied under laboratory controlled environmental systems. Particular emphasis was directed toward the investigation of the fundamental adsorption phenomena which occurred in selected pesticide-clay systems. The effects of certain environmental stresses, including pH, temperature and salt (NaCl) concentration of water, on the behavior of sorption and desorption were also studied. Pesticides selected for this study included DDT, dieldrin and heptachlor, and clay minerals employed were kaolinite, montmorillonite and illite. Chlorinated hydrocarbon pesticides were rapidly adsorbed by the experimental clay minerals; in most cases the adsorption equilibria were reached within two hours of reaction. After the pesticides had been adsorbed on the clays, desorption of the pesticides occurred only to a very small extent. The pH, temperature and salt (NaCl) concentration of water did not appear to exert significant effects. (Knapp-USGS)
W71-05447

DIGITAL SIMULATION MODEL OF INORGANIC WATER QUALITY OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA, PROGRESS REPORT,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 05G.
W71-05469

A THERMAL PROFILE OF THE WATERS OF NEW YORK STATE.
New York State Atomic and Space Development Authority, New York; and New York State Dept. of Environmental Conservation, Albany.

Report of the New York State Atomic and Space Development Authority, 1970. 26 p, 1 tab, 5 fig, 32 images.

Descriptors: *Thermal pollution, *Powerplants, *Environmental engineering, *Water temperature, *Cooling, Infrared radiation, Remote sensing, Water pollution sources.
Identifiers: *New York.

Existing temperature patterns of New York State's major bodies of water were determined. Base line data on the extent and location of natural and artificial heat sources are provided. Large natural variations in water temperature caused by geographic location and seasonal variations were recorded along with the 'fine structure' of temperature influenced by flow, depth, tidal effects and mixing. Diffusion and dissipation patterns of man-made thermal discharges in various bodies of water were investigated. The survey was conducted in ponds, marshes, rivers, lakes and coastal waters. Airborne infrared sensing devices and data collection and recording equipment were used and reduced by computer to produce the thermal profiles. Results of the survey will be used for site selection for future nuclear powerplants and for predicting dissipation and dispersion of future thermal discharges along with better designs of outfall and cooling facilities for full protection of the environment. (Ensign-PAI)
W71-05503

DIFFUSION OF SEWAGE EFFLUENT FROM AN OCEAN OUTFALL,
Environmental Engineering, Inc., Gainesville, Fla.
R. H. Jones, and R. E. Stewart.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 99-108, 1970. 1 tab, 2 fig, 3 ref.

Descriptors: *Water pollution sources, *Outlets, *Sewage effluents, *Diffusion, Coliforms, Bacteria, Florida.
Identifiers: *Pompano Beach.

Diffusion investigations were carried out to estimate coliform bacteria concentration patterns of sewage effluent from an ocean outfall at Pompano Beach, Florida. The physical oceanography of the near-shore currents, turbulent diffusion of the sewage effluent, and natural die-off of the coliform bacteria were studied. A current meter array, current-cross observations, and fluorescein dye were used to determine the near-shore current patterns. The sewage-dye plume, after Rhodamin dye was injected, was tracked by a fluorimeter. Coliform bacteria die-off rates were determined which indicated that during the summer months the natural die-off is approximately two orders of magnitude greater than that during the winter. A model to assess future outfall installations was developed. (Ensign-PAI)
W71-05507

MANGANESE CONTENT AND THE OCCURRENCE OF FALLOUT 54MN IN SOME MARINE BENTHOS OF THE MEDITERRANEAN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco); and Centre Scientifique de Monaco, Monte Carlo. Laboratoire de Radio-Activite Appliquee.
For primary bibliographic entry see Field 05C.
W71-05518

SEASONAL VARIATIONS IN INORGANIC PHYTOPLANKTON NUTRIENTS IN THE INSHORE WATERS OF CARDIGAN BAY,
University Coll. of Wales, Aberystwyth. Dept. of Botany.
J. B. Sykes, and A. D. Boney.
Journal of the Marine Biological Association of the United Kingdom, Vol 50, No 3, p 819-827, 1970. 2 fig, 2 tab, 24 ref.

Descriptors: *Water pollution sources, *Seasonal, *Phytoplankton, *Nutrients, Phosphates, Nitrates, Silicates.
Identifiers: Cardigan Bay, Wales.

Concentrations of inorganic phosphate, nitrate and reactive silicate were studied in the inshore waters of Cardigan Bay during 1967-68. The observed variations were largely due to phytoplankton activity and meteorological conditions. During the winter months all nutrients were at their peak and all showed minimum concentrations during the summer. Inorganic phosphate seemed to decrease when nitrate and silicate concentrations were high. River drainage and freshwater run-off, introducing various pollutants in the study area had a definite effect on the nutrient balance. (Ensign-PAI)
W71-05519

INSTRUMENT TO MEASURE WEAK SEA CURRENTS,
Ente Nazionale per l'Energia Elettrica. Cellole (Italy). Laboratorio Ricerche Ambientali Garigliano.
G. Bartoli, G. Sandrelli, and G. Sorrentino.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 109-123, 1970. 3 fig, 4 ref.

Descriptors: *Currents, *Current meters, *Pollution abatement, *Diffusion, Instrumentation, Water pollution sources.
Identifiers: *Sea currents.

It is necessary in diffusion problems to measure sea currents of speeds less than the threshold of sensitivity of current meters normally used. A new instrument is described, where by abandoning all the mechanical systems which always have friction and exploit the cooling down of a hot thermistor which is suitably compensated for by the temperature variations of the water, a threshold of 0,3 cm/sec. can be reached. Direction measurement is obtained by a magnetic needle with optical finders and a rotating element with a double direction of rotation which registers position with a circular potentiometer. Measurement of a minimal movement in the direction of 3 degrees is possible. The maximum duration of the instrument is 5 days and can be used to a depth of 30 meters. (Ensign-PAI)
W71-05522

ON THE UNUSUAL PATTERNS OF PHOSPHATE VERTICAL DISTRIBUTION IN THE TAMAR ESTUARY,
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.

J. P. Mommaerts.
Journal of the Marine Biological Association of United Kingdom, Vol 50, No 3, p 849-855, 1970. 4 fig, 1 tab, 5 ref.

Descriptors: *Water pollution sources, *Phosphates, *Distribution patterns, *Estuaries.
Identifiers: Vertical distribution, *Tamar Estuary, Great Britain.

Anomalies in the vertical profile of phosphate concentration were revealed in a chemical investigation of the Tamar Estuary. These variations were not matched by that of salinity. Correlations between nitrogen and salinity and silicate and salinity were excellent. Biological activity and pollution as possible causes of this phenomenon are discussed. (Ensign-PAI)
W71-05525

THE FATE OF INTESTINAL BACTERIA IN THE SEA,
Harvard Univ., Cambridge. Div. of Engineering and Applied Physics.
Ralph Mitchell, and Morris J. Carrell.
Advances in Water Pollution Research, International Conference on Water Pollution Research, Fourth, Proceedings, Prague, Czechoslovakia, April 21-25, 1969, Pergamon Press, New York, p 811-821, 1969. 2 fig, 2 tab, 8 ref.

Descriptors: *Sewage, Sea water, *Self-purification, *Microorganisms, *Marine microorganisms, *Sewage bacteria, Water pollution sources, Waste disposal.
Identifiers: E. coli, Bdellovibrio, Pseudomonas, Nematodes.

Native marine microflora is active in the death of intestinal bacteria in the sea and the death rate increases with increase of the marine microbial population. Several groups of bacteria have been found to be associated with E. coli kill in sea water. Pseudomonas, causes death by enzymatically lysing the cell walls of the intestinal bacteria. Bdellovibrio, is parasitic and acts by actively parasitizing the coliforms and using the whole cell as a carbon source. Nematodes have also been found to prey on intestinal bacteria. It is likely that the significance of each group will vary temporarally and geographically depending on the ecoloigcal circumstances. There is reason to believe that the ecological principles that apply to the sea would also apply to other environments. (Ensign-PAI)
W71-05527

DISPERSION PHENOMENA IN COASTAL ENVIRONMENTS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
Klas Cederwall.
Boston Society of Civil Engineers, Journal, Vol 57, No 1, p 34-70, January 1970. 10 fig, 33 ref.

Descriptors: *Waste disposal, *Sewage, *Thermal pollution, *Dispersion, *Mathematical models, Site investigations, Water pollution sources, Environment.

Approaches for studying dispersion phenomena in coastal environments is discussed and applicable methodology is reviewed. Since mathematical models are widely used in hydrology for prototype simulation the principles for mathematical modeling of dispersion phenomena are presented. Advances in field measuring techniques as they apply to water pollution studies are reviewed. (Ensign-PAI)
W71-05528

NUMERICAL SIMULATION OF WATER QUALITY IN COASTAL WATERS AND ESTUARIES,
Rand Corp., Santa Monica, Calif.
J. J. Leendertse.
1970 IEEE International Conference on Engineering in the Ocean Environment, Panama City, Florida, September 21-24, 1970, Digest of Technical Papers, p 253-255. 2 ref.

Descriptors: *Estuaries, *Coasts, *Water quality, *Management, *Waste disposal, Dispersion, Tides, Flow, Model studies.
Identifiers: *Numerical simulation, *Fluid wastes.

Water quality management in coastal waters and estuaries must assess the effects of fluid wastes entering these waters. A model which computes the tidal flow and time-varying water levels in well mixed estuaries and coastal waters where salinity distributions at any point are uniform over the vertical was developed. The various composition of the fluid wastes can react with each other or with substances in the water so a reaction model was included. These reaction rates are influenced by water temperature and solar radiation. Wind and waves effect the exchange of gases at the water surface. Adjustment of the model using field measurements was necessary to establish the functional relationships. (Ensign-PAI)
W71-05539

THE USE OF RADIOISOTOPE TRACERS IN THE STUDY OF THE DISPERSION AND INACTIVATION OF BACTERIA DISCHARGED IN COASTAL WATERS,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre; Hadassah Medical School, Jerusalem (Israel); and Tel-Aviv District Public Health Lab. (Israel).
Chaim Gilat, H. I. Shuval, Y. Yoshpe-Purer, and Naftali Cohen.
Developments in Water Quality Research. Jerusalem International Conference on Water Quality and Pollution Research, Proceedings, Jerusalem Israel, June 1969, Tel Aviv, Ann Arbor Humphrey Science Publ, p 269-288, 1970. 8 fig, 9 ref.

Descriptors: *Radioisotopes, *Tracers, *Waste water disposal, *Bacteria, *Microorganisms, Water pollution sources.
Identifiers: Microbial dispersion, Microbial activation, Coastal waters.

The ever-increasing waste water disposal into coastal waters calls for the development of a realistic approach to define the influence of environmental factors which aid in dispersing and inactivating microbial pollutants. Data on rates of bacterial die-away in the Mediterranean is scant and very little data has been gathered on bacterial dispersion patterns on the shores of Israel. This investigation is an attempt at determining bacterial disappearance rates and dispersion patterns in situ by radioisotope tracer methods. Sewage outfall at Reading, north of Tel Aviv, was the site of these studies as it is representative of coastal conditions along Israel's southern Mediterranean shore. (Ensign-PAI)
W71-05545

THE DIFFUSION OF BACTERIAL POLLUTION IN THE SEA,
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 05C.
W71-05547

SURVEY AND PREDICTION OF POLLUTION IN THE OMUTA INDUSTRIAL HARBOUR,
Kyoto Univ. (Japan).
Shigehisa Iwai, Yoriteru Imoue, and Haruo Higuchi.
International Conference on Water Pollution Research, Fourth, Proceedings, Prague, Czechoslovakia, April 21-25, 1969, Pergamon Press, New York, p 883-899, 1969. 9 fig, 6 tab, 13 ref.

Descriptors: *Industrial wastes, *Dispersion, *Tracers, *Aerial photography, *Land reclamation, *Construction, Harbors, Coasts, Water pollution sources.
Identifiers: Survey, Predictions, Japan.

A new harbor is now under construction in Japa and is expected to be completed within three yeara Coastal pollution is discussed for the period follow ing land reclamation and construction. Propp counter-measures should be planned now in ordd to prevent the expected increase in pollutior Dispersion of pollutants near the shore can be quit accurately analysed by aerial photographs follow ing a cloud of tracer dye. The dispersion coeffi cients estimated from the photographs agreed wit those based on concentrations of dye from actua samples of the sea. The current and the dispersio coefficients cannot be simulated at one time by series of model tests. The actual currents as the flow should be considered first and then the dispe sion coefficients. The model gave lower dispersio coefficients than the actual ones even after th coefficients were corrected to allow for the scale the model. (Ensign-PAI)
W71-05548

TWELFTH CONFERENCE ON GREAT LAKE RESEARCH,
Michigan Univ., Ann Arbor. Great Lakes Researc Div.; and Bureau of Commercial Fisheries, Ann Ar bor. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 02H.
W71-05561

TRANSPORT OF TRACE METALS TO THE AT LANTIC OCEAN BY THREE SOUTHEASTERN RIVERS,
Skidaway Inst. of Oceanography, Savannah, Ga and Georgia Inst. of Tech. Atlanta.
H. L. Windom, K. C. Beck, and R. Smith.
Southeastern Geology, Vol 12, No 3, p 169-181 January 1971. 13 p, 6 fig, 4 tab, 14 ref.

Descriptors: *Trace elements, *Dissolved solids *Streamflow, *Sea water, *Estuaries, Chemica precipitation, Runoff, Sediment yield, Wate chemistry, Bottom sediments, Atlantic Ocean Geochemistry, Oceanography, Solutes, Suspende load.
Identifiers: Trace metal transport, Ocean chemis try.

Composition of trace metals in solution in estuaries of three Southeastern rivers are similar. Dissolved iron and possibly manganese decrease in concen tration going from fresh to saline waters owing to precipitation. The composition of trace metals in suspended sediment from the estuaries of the three rivers differs, suggesting a relationship to the com position of the respective drainage basin. The total amount of trace metals transported to the Atlantic in both solution and suspension by these rivers ap pears to be insufficient to supply more than about 100 sq km of average Atlantic deep sea sediment. River runoff appears to be inadequate to explain the trace metal accumulation of North Atlantic deep-sea sediments. (Knapp-USGS)
W71-05579

RHINE RIVER POLLUTION STUDIES,
Cornelius Biemond.
Journal American Water Works Association, Vol 63, No 1, p 36-40, January 1971. 5 p, 3 fig, 3 tab, 7 ref.

Descriptors: *Water pollution sources, *Water pol lution control, *Surveys, *Rivers, Industrial wastes, Mine wastes, Sewage, Oily water, Dissolved ox ygen, Nutrients.
Identifiers: *Rhine River.

As for all rivers of highly developed areas, the pollution of the Rhine has become a serious problem. The countries concerned (Switzerland, France, Western Germany, Luxemburg and The Netherlands) have agreed to the initiation and continuation of the International Commission for the Protection of the Rhine against Pollution. The powers of the commission are limited to collaboration in research and investigations and to the unanimous

formulation of proposals to the governments. For the pollution problems, the periods of low flow are the critical ones. They usually occur around the month of October, when snowmelt in Switzerland has ceased and autumn rains in the remainder of the basin are delayed. Most of the sewage from towns and industries is discharged untreated or only mechanically treated. Apart from domestic and industrial sewage, there is a continuous discharge of mineral matter by mines and industries, which has led to an increasing load of dissolved minerals. (Knapp-USGS)
W71-05581

A DISCUSSION OF THE CHEMICAL CHARACTER OF WATER MIXTURES,
California Univ., Berkeley. Dept. of Chemistry.
R. Rhodes Trussell, and Jerome F. Thomas.
Journal of American Water Works Association, Vol 63, No 1, p 49-51, January 1971. 3 p, 6 fig, 6 tab, 7 ref.

Descriptors: *Mixing, *Water chemistry, *Hydrogen ion concentration, Water quality, Equilibrium, Carbon dioxide, Carbonates, Alkalinity, Calcium carbonate, Computer programs.
Identifiers: *Buffering.

As potable water is usually a blend from several sources, it is necessary to predict the chemical characteristics of various mixtures. In addition, problems of mixing have been encountered in deep well injection at the interface between the receiving water and the water being injected. The hydrogen-ion concentration of the water is primarily governed by the CO2 buffer system. The bicarbonate equilibria are used to predict pH. A general equation of simple form governing the CO2 buffering system is presented. A short computer program is outlined to use this equation to simulate the mixing of waters, and some results are illustrated. (Knapp-USGS)
W71-05582

PHOSPHATE MOVEMENT IN SURFACE RUNOFF WATER,
Ministry of Works, Nelson (New Zealand). Moutere Soil Conservation Station.
A. N. Gilchrist, and A. G. Gillingham.
New Zealand Journal of Agricultural Research, Vol 13, p 225-231, 1970. 2 fig, 3 tab, 8 ref.

Descriptors: *Phosphate, *Surface run-off, *Rainfall, *Fertilizers, Path of pollutants, Nutrients.
Identifiers: New Zealand.

Intense simulated rainfall was applied to small plots topdressed in strips with aerial superphosphate at 4 cwt per acre to determine how much and, within the limits of the apparatus, how far the water-soluble fraction could be moved down slope in surface run-off water. It was found that 3 in. of rainfall (2 in. of run-off) in 1 hr could remove 28% of the fertilizer placed in a 3 in. wide band at a distance of 2-1/4 - 2-1/2 ft up slope from a collecting tray. (Little-Battelle)
W71-05625

SEDIMENT-WATER NUTRIENT RELATIONSHIPS - PARTS 1 AND 2,
Federal Water Quality Administration, Cincinnati. Field Investigations Branch.
Gerald D. McKee, Loys P. Parrish, Carl R. Hirth, Kenneth M. Mackenthum, and Lowell E. Leup.
Water and Sewage Works, Vol 117, No 6, p 203-206, June 1970. 23 ref; No 7, p 246-250, July 1970. 4 fig, 27 ref.

Descriptors: *Nutrients, *Sediments, *Water analysis, Lake Morphology, Sedimentation, Plankton, Diel migration, Protozoa, Hydrogen ion concentration, Water temperature, Bacteria, Algae, Alkalinity, Iron, Phosphate, Phosphorus, Carbon, Nitrogen, Currents (Water), Winds, Nevada, California, New York, Oregon, Wisconsin, Maine.
Identifiers: Fecal material, Lake Tahoe, Lake Sebasticook (Maine), Fayetteville Green Lake (New York), Upper Klamath Lake (Oregon), Lake Mendota (Wisconsin).

A thorough review of the mechanisms of nutrient deposition and exchange in aquatic environments led to the following conclusions: (1) A portion of the nutrients, soluble and insoluble, in a water body are ultimately destined to become part of the sediments. (2) Organisms are primary concentrators of dissolved nutrients. (3) The initial areas of deposition may be only temporary, the nutrient-containing sediments may be re-dissolved or may be physically transported. (4) Wind-induced currents are a major factor that determines the rate and area of final deposition and the contact time between suspended sediments and water. (5) Morphology of the water body affects the ultimate area of deposition. (6) Aquatic organisms convert inorganic nutrients to organic nutrients and vice versa. (7) Suspension of sediments increases their effect on the overlying water. (8) The sediments act as reservoirs of nutrients for the overlying water. (9) The rapidity of sediment build-up will affect the degree of influence on the overlying water. (Little-Battelle)
W71-05626

RESIDUES IN FISH, WILDLIFE AND ESTUARIES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
David J. Hansen, and Alfred J. Wilson, Jr.
Pesticides Monitoring Journal, Vol 4, No 2, p 51-56, September 1970. 1 fig, 2 tab, 6 ref.

Descriptors: *DDT, *Perches, *Water pollution effects, Dieldrin, Endrin, Florida, Estuaries, Oysters, Gas chromatography, Migration, Wildlife.
Identifiers: *Pinfish, Sample preservation, Pigfish, Atlantic croaker, Spot, Thin-layer chromatography, Metabolites, DDD, DDE.

Pesticide residues in fishes from the estuary near Pensacola, Fla., monitored from April 1964 to November 1965, are compared with residues in fishes exposed to DDT in the laboratory. DDT in fish exposed to 0.1 ppb p,p'-DDT for 5 weeks failed to increase after the second week, when maximum concentrations reached 38,000 times that in the test water. Loss of DDT from these fish was slow, 78%-87% in 8 weeks. The amounts of DDD or DDE in fish did not increase either during or after exposure. (Little-Battelle)
W71-05643

THE COURSE OF BIODEGRADATION OF ANIONIC DETERGENTS BY ANALYSES FOR CARBON, METHYLENE BLUE ACTIVE SUBSTANCE AND SULFATE ION,
Department of Agriculture, Philadelphia, Pa. Eastern Utilization Research and Development Div.
T. C. Cardon, E. W. Maurer, and A. J. Stirton.
Journal of the American Oil Chemists' Society, Vol 47, No 6, p 203-206, June 1970. 7 fig, 1 tab, 7 ref.

Descriptors: *Alcohol, *Sodium sulfates, Biodegradation, Carbon, Detergents, Turbidity, Microorganisms, *Linear alkylate sulfonates.
Identifiers: *Methylene blue active substance, *Sulfate ion, Glucose, Esso research test, Auto analyzer.

The results are presented of an investigation of the metabolism of tallow-based detergents and a mechanism of their breakdown by sewage microorganisms under aerobic conditions. The detergents were tallow alcohol sulfates, ether alcohol sulfates, and esters of a-sulfo fatty acids. Other compounds were included to help relate structure to ease of biodegradation. The individual isomer sodium p-(1-methylundecyl) benzenesulfonate (LAS) was used as a reference standard. Since biodegradation was followed by loss of carbon and methylene blue active substance (MBAS) and formation of sulfate ions, the Esso research test was employed as a basis for a method for the measurement of these subfactors. Tallow alcohol sulfates were rapidly and completely degraded; ether alcohol sulfates not quite so rapidly. Reduction in MBAS was rapid for the a-sulfo esters, but loss of carbon and formation of sulfate ion were incomplete, possibly because of the intermediate formation of a resistent sulfosuccinate. Figures show the rates of biodegradation of various alcohol sulfates and fatty acids as determined by carbon loss, MBAS reduction, and formation of sulfate ions. (McCann-Battelle)
W71-05653

GROUNDWATER POLLUTION,
Michigan Dept. of Public Health, Lansing Section of Water Supply.
Donald K. Keech.
Typescript, 1970. 20 p.

Descriptors: *Water pollution, *Groundwater, *Path of pollutants, *Pollutant identification, *Michigan toxins, Soil contamination, Wastes, Water pollution control, Water pollution effects, Water pollution sources, Natural gas, Gasoline, Calcium chloride, Aquatic bacteria, Waste disposal, Detergents, Michigan.
Identifiers: *Chemical contamination, Salt, Brine, Natural gas erruptions.

The purpose of this paper is to show, mainly by example, how the valuable groundwater resource has been contaminated, primarily through negligent practices. Pollution of groundwater results in degradation of the water quality in one of three categories: Micro-biological, chemical, and physical. Case histories of various contaminations within the State of Michigan are explored. The report is well documented and well illustrated. It stresses concern over possible problems than can cause irreversible damage to the valuable groundwater resource. (Campbell-NWWA)
W71-05693

RURAL RUNOFF AS A FACTOR IN STREAM POLLUTION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
R. B. Weidner, A. G. Christianson, S. R. Weibel, and G. G. Robeck.
Journal Water Pollution Control Federation, Vol 41, No 3, p 377-384, March 1969. 10 tab, 6 fig, 3 ref.

Descriptors: *Surface runoff, *Water pollution, Farm wastes, Storm runoff, Water quality, Acreage, Cultivated lands, Grasslands, Pastures, Forests, Urbanization, Land use, Nitrogen, Phosphorus, Soil erosion, Watersheds, Physical characteristics, Slopes, Fertilizers, Pesticides, Mulching, Flow measurement, Sampling, Flumes, Coliforms, Precipitation, Rainfall intensity, Time, Corn, Regression analysis, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: Soil characteristics, Measuring flume.

The results of this work indicate that rural runoff is a factor in stream pollution and that it must be considered when one evaluates the quality of any stream or receiving body of water. However, there also must be an awareness that there are some means available for reducing this pollutional load. This study showed that, despite an increase in the amount of fertilizers and manure applied under improved practices, there was a marked decrease in the amount of pollutional load that came from these watersheds as contrasted to the load from watersheds using prevailing practices. Runoff, soil loss, and microbial densities were considered. (White-Iowa State)
W71-05746

ORIGINS AND NATURE OF FARM WASTES,
National Agricultural Advisory Service, London (England).
K. B. C. Jones, and C. T. Riley.

Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 1, p 7-14, 1970. 9 tab.

Descriptors: *Farm wastes, *Disposal, Rain water, Costs, Cattle, Hogs, Poultry, Planning, Legislation, Legal aspects, Economics, *Waste disposal.
Identifiers: *United Kingdom, Washing-down water, Nature of waste, Population equivalents, Origins of waste.

Waste disposal is discussed in relation to population expansion, diminishing acres, declining numbers of agriculture workers, economic pressures, limited natural water resources, and legal pressures. The origin and nature of the wastes that must be disposed of is discussed. The trends in planning and disposal patterns taking place were considered. The costs associated with disposal were examined in relation to the income produced. Food processing waste has created some disposal problems for farmers. The disposal problems created by fruit and meat processing are discussed in the last portion of the paper. (See also W71-05747). (Christenbury-Iowa State)
W71-05748

ORIGINS AND NATURE OF FARM WASTES: DISCUSSION,
Gowan, Douglas.
Douglas Gowan.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 2, p 15-18, 1970. 1 tab.

Descriptors: Farm wastes, Disposal, Legislation, Discharge (Water), Sewers.
Identifiers: River authorities, Extensive farmer, Intensive farmer, United Kingdom, Public sewers.

Disposal of farm waste has become a major problem. A wholehearted effort is needed to deal with the problem, involving men, laboratories, and money. Also the farmers themselves must lend practical assistance. The law is there, and social and economic pressures are unlikely to ease. Nor is farming going to become less intensive, when this is the only way to profit, and the increasing public demand for food exists. All must combine to make sure that our inherent desire for increased water resources and pleasant-looking and smelling countryside facilities are one day realized. (See also W71-05747). (Christenbury-Iowa State)
W71-05749

TURBULENT MIXING IN SUBMERGED TWO-DIMENSIONAL WALL JETS,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
For primary bibliographic entry see Field 08B.
W71-05767

RECOVERY, SEPARATION, AND IDENTIFICATION OF PHENOLIC COMPOUNDS FROM POLLUTED WATERS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 05A.
W71-05768

WATER-QUALITY STUDIES ON THE KALAMAZOO RIVER,
Michigan State Univ., East Lansing. Inst. of Water Research.
Allen W. Knight, and George H. Lauff.
Institute of Water Research, Technical Report No 5, Michigan State University, East Lansing, Michigan, September 1969. 61 p, 10 fig, 17 tab.

Descriptors: *Water quality, Self-purification, *Pollution abatement, Environment, Ecology, Water pollution control, Water pollution sources.
Identifiers: Environmental problems, Macroinvertebrates.

The Kalamazoo River was studied to ascertain conditions just prior to a pollution-abatement program. The river was found grossly polluted in a twenty-mile stretch below the City of Kalamazoo. The decomposition of organic matter in the water and in extensive silt accumulations frequently depleted the dissolved oxygen for twenty miles or more below Kalamazoo. Sewage fungus covered the surface of the sludge deposits and stationary objects in the water, while extensive numbers of sludge worms frequently occurred as an enormous red fringe along the river margins. Only a few of the more tolerant macroinvertebrates and fish occurred in the very polluted zone. In the lower reaches of the river, considerable self-purification was accomplished, accompanied by a return of many of the Macroinvertebrates and game fish. Prior to its discharge, the river accomplished considerable self-purification but still carried a large load of suspended and dissolved materials into Lake Michigan. (Wray-Chicago)
W71-05774

BACKGROUND PAPERS ON COASTAL WASTES MANAGEMENT.
National Academy of Sciences-National Research Council, Washington, D.C. Committee of Oceanography; and National Academy of Engineering, Washington, D.C. Committee on Ocean Engineering.

Prepared for Coastal Wastes Management Study Session held at Jackson Hole, Wyo. 6-12 July 1969. Available from NTIS as PB-198 032, $6.00 paper copy, $0.95 in microfiche. Washington, DC, Vol I, 1969. 391 p. FWQA Program 16060 DUF 07/69.

Descriptors: Water pollution sources, *Water pollution control, Wastes, *Pollutant identification, *Coasts, Water pollution effects, Estuaries.
Identifiers: Coastal wastes.

This collection of background papers in coastal wastes management is a supplement to the NAS-NAE report, 'Wastes Management Concepts for the Coastal Zone Requirements for Research and Investigation.' (See W71-01544). The report itself was prepared under the auspices of the Committee on Oceanography of the National Academy of Sciences (NASCO) and the Committee on Ocean Engineering of the National Academy of Engineering (NAECOE). The study session was convened for the purpose of reviewing the state-of-the-art and knowledge concerning the disposal of wastes in the coastal environment, and identifying the areas in which expansion of scientific and engineering knowledge is required for rational evaluation of waste management problems in the coastal zone. (See also W71-05788 thru W71-05803)
W71-05787

EVALUATION OF SOURCES AND CHARACTERISTICS OF WASTE DISCHARGES,
Los Angeles Bureau of Sanitation, Calif.
Robert D. Borgman, and John D. Parkhurst.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p II-117.

Descriptors: *Wastes, *Water pollution sources, *Human population, *Ecology, *Pollutants, Farm wastes, Mine wastes, Municipal wastes, Solid wastes, Radioactive wastes, Chemical wastes.

Waste discharges as they affect the littoral region of U.S. coasts are evaluated. Agricultural and mining wastes make up 2.3 billion tons per year. Air pollution discharges, liquid and solid municipal wastes and automobile bodies contribute 507 million tons per year to these areas. The composition, decomposition and treatment of known wastes along with the standard methods of sampling, monitoring and analysis are discussed. The speculative unknown waste discharges are discussed and the need for systematic summation and integration of the known wastes are considered. (See also W71-05787) (Ensign-PAI)
W71-05788

MONITORING OF THE MARINE ENVIROD MENT FOR WASTE COMPONENTS AND FO EFFECTS OF THE INTRODUCED WASTES,
Texas A and M Univ., College Station. Dept. Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-05789

NEW YORK CITY - A MAJOR SOURCE O MARINE SEDIMENT,
State Univ. of New York, Stony Brook. Mariri Sciences Research Center.
M. Grant Gross.
Background Papers on Coastal Wastes Manag ment, prepared for National Academy of Science Committee on Oceanography and the Nation Academy of Engineering Committee on Ocean E gineering, Wash, DC, Vol 1, 1969, p III 1-III 24. fig, 7 tab, 11 ref.

Descriptors: *Water pollution sources, *Soli wastes, *Sediment, Dredging, Construction Human population.
Identifiers: New York City.

The largest single source of sediment enterin directly into the Atlantic Ocean from North Ame ica consists of 8.6 million tons per year of soli waste dumped into Western Long Island Sound Dredging, construction and demolition wastes the metropolitan region were dumped in area where little modern sediment had accumulated The average annual discharge for the New Yor metropolitan region was estimated at 0.75 tons pe person. Data on the physical properties of thes wastes, volumes from various sources an discharge rates are presented. Rates for natura river sediment discharge is given for comparison (See also W71-05787) (Ensign-PAI)
W71-05790

WASTE DISCHARGE MONITORING,
California Univ., Berkeley. Div. of Hydraulic an Sanitary Engineering.
For primary bibliographic entry see Field 05A.
W71-05791

PHYSICAL PROCESSES IN COASTAL AREAS,
Johns Hopkins Univ., Baltimore, Md. Chesapeak Bay Inst.
Harry H. Carter.
Background Papers on Coastal Wastes Manage ment, prepared for National Academy of Science Committee on Oceanography and the Nationa Academy of Engineering Committee on Ocean En gineering, Wash, DC, Vol 1, 1969, p V 1-V 16. fig, 3 tab, 8 ref.

Descriptors: *Coasts, *Wastes, *Water pollution sources, *Distribution, *Advection, *Diffusion.
Identifiers: *Removal processes, Geologica processes, Biological processes, Chemica processes, Floatables, Sinkables.

Waste management in the coastal zone is basically determination of the capacity to receive waste without undesirable effects on the environment. To determine this capacity the distrubtion of the sources, the physical processes of advection and diffusion and the geological, biological and chemical processes of removal are considered. Adequacy of existing knowledge as a foundation for predic tion and the proposed objectives for gaining further knowledge are discussed and presented in order of priority. (See also W71-05787) (Ensign-PAI)
W71-05792

PHYSICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
Akira Okubo.

Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p VI 1-VI 38. 5 fig, 22 ref.

Descriptors: *Estuaries, *Wastes, *Pollutants, *Distribution, *Water circulation, *Movement, *Diffusion, *Mixing.
Identifiers: Hydraulic models, Mathematical equations.

The distribution of wastes and the physical processes which influence and interact with these wastes in estuaries and tributary embayments are discussed. The various types of circulation patterns are presented with the description and basic equations of the processes which produce the dispersion of waste materials. Details of the investigation of existing knowledge, as a frame of reference for pollution prediction, and the need for further investigation of eddy-fluxes, shear effect, entrapment phenomenon and the use of hydraulic models are considered. (See also W71-05787) (Ensign-PAI)
W71-05793

DISPERSION OF NON-CONSERVATIVE WASTES DISCHARGED INTO THE OCEAN,
Loyola Univ., Los Angeles, Calif.
James E. Foxworthy.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p VII 1-VII 21. 3 fig, 27 ref.

Descriptors: *Wastes, *Dispersion, *Diffusion, *Waste dilution, *Bacteria, *Indicators, *Coliforms, Mortality, Mathematical models.

In the design of waste disposal facilities it is necessary to provide more efficient outfall systems and better waste treatment. In answer to these needs dispersion of non-conservative material has been investigated and the findings and recommendations for further study are presented. Mathematical models used to quantify the dispersion characteristics and estimation of the magnitude of the diffusion parameters and initial plume size, in order to apply these model equations, are discussed. Both horizontal and vertical diffusion in the ocean are included. Empirical relationships in estimating dilution of oceanic waste plumes are demonstrated and the significance of source size on the predicted rates of dilution is pointed out. Physical dilution and coliform mortality is demonstrated by the results of a field experiment. (See also W71-05787) (Ensign-PAI)
W71-05794

PHYSICAL EFFECTS ON RECEIVING WATERS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W71-05795

CHEMICAL AND GEOCHEMICAL EFFECTS ON RECEIVING WATER,
Alaska Univ., College. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W71-05796

CHEMICAL AND GEOCHEMICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT, AND CHEMICAL AND GEOCHEMICAL EFFECTS ON THE RECEIVING WATERS,
California Inst. of Tech., Pasadena; and Pomeroy, Johnston, and Bailey, Pasadena, Calif.
James J. Morgan, and Richard D. Pomeroy.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p X 1-X 44. 1 fig, 8 tab, 20 ref.

Descriptors: *Wastes, *Water pollution sources, *Chemical analysis, *Geochemistry, *Trace elements, Absorption, Precipitation, Oxidation-reduction potential, Organic compounds, Carbon, Metals, Organic matter, Radioisotopes, Surfactants.

Concentrations of minor constituents in the ocean, and the forms they take: metallic elements, nitrogen, phosphorus, silica, and living and non-living organic matter are reviewed. The physical-chemical processes regulating the composition of the oceans such as reactivity and mass balance of elements added to the sea, adsorption-desorption reactions of trace metals, precipitation-dissolution reactions, oxidation and reduction processes and biological concentrations are described. Organic carbon in the oceans, cycling between sea-land and sea-atmosphere, and the metal organic complexes in sea water are also discussed. The changes caused by man's activities and the effect of changed rates of element additions to the oceans along with additions of unnatural substances by rivers, industrial and domestic wastes, outfalls, shipping, mining, and fallout are considered. (See also W71-05787) (Ensign-PAI)
W71-05797

SOME CHEMICAL AND GEOCHEMICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
Francis A. Richards.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XI 1-XI 25. 2 tab, 27 ref.

Descriptors: *Wastes, *Environment, *Chemical analysis, *Geochemistry, *Distribution, Oxidation-reduction potential, Precipitation, Chemical reactions, Flocculation, Aggregates, Sorption.
Identifiers: Complexation.

The inorganic chemical and geochemical reactions that take place when foreign materials are introduced into the ocean are discussed with emphasis on the non-life processes. The kinds of processes that can take place, a review of present knowledge of these processes and suggestions for future research on how these processes are concerned in coastal waters management are presented. Included in these processes are changes in phase, oxidation state, ionic or molecular speciation, and chemical activity caused by any process which changes temperature, pressure, ionic strength, or composition. Specifically, processes of acid-base reactions, redox reactions, complexation, ion exchange reactions, sorption, precipitation, flocculation and aggregation are covered. It is pointed out that toxic and non-toxic wastes should have quite different chemical and geochemical consequences. (See also W71-05787) (Ensign-PAI)
W71-05798

BIOLOGICAL EFFECTS OF WASTE DISCHARGES ON COASTAL RECEIVING WATERS,
Engineering-Science, Inc, Forest Hills, N.Y.; and Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 05C.
W71-05799

BIOLOGICAL EFFECTS ON RECEIVING WATERS,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.
W71-05800

BIOLOGICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
Loren D. Jensen.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XIV 1-XIV 9. 6 ref.

Descriptors: *Wastes, *Environment, *Distribution, *Biology, Organic compounds, Inorganic compounds, Bacteria, Biodegradation.

Living organisms inhabiting surface waters are adapted to dilute solutions of inorganic salts, atmospheric gases and extracted organic materials. Due to the volumes involved and the dilute nature of the waste streams and coastal waters the physical, chemical and biological processes that occur when such solutions mix are considered. The main biological processes which are involved with waste stabilization are bacterial fermentation which occur on wetted surfaces. The exploitation of these processes is the primary mechanism of waste stabilization with conventional biological waste treatment systems. These biological processes which interact with and influence the distribution of wastes are discussed in detail. See also W71-05787) (Ensign-PAI)
W71-05801

THE COASTAL POLLUTION PROBLEM IN CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
John A. McGowan.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XV 1-XV 3.

Descriptors: *Waste disposal, *Oceans, *Water pollution control.
Identifiers: *California, Tolerable waste limits, Pollution study grants, Regional planning, Basic research, Sampling, Monitoring.

A three month study of the literature on coastal waste disposal in California indicates that the magnitude of coastal pollution has not yet reached that of the state's fresh waters and estuaries but they are definitely in the incipient stages of such magnitude. The many sewage outfalls are greatly influencing the ecology of the coastal zone. Particulate organic detritus deposits in the area of outfalls seem to be increasing and it is doubtful an equilibrium will be reached. More of these outfalls are being planned and since coastal waters do not mix perfectly the outlook for coastal ecology is not good. Proposals for tolerable limits; pollution studies grant proposals; development of ecological, biochemical and physiological indices; and regional planning for research laboratories and waste disposal systems are set forth. (See also W71-05787) (Ensign-PAI)
W71-05802

BIOLOGICAL EFFECTS ON RECEIVING WATERS: THE PLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05C.
W71-05803

5C. Effects of Pollution

SLUDGE DUMPING IN THE THAMES ESTUARY,
Ministry of Agriculture, Fisheries and Foods, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W71-05342

MARINE POLLUTION PROBLEMS IN JAMAICA,
University of the West Indies, Kingston (Jamaica). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W71-05349

MODELING OF THE NITROGEN AND ALGAL CYCLES IN ESTUARIES,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 02L.
W71-05390

PHOSPHATE DISTRIBUTION IN FOX AND WOLF RIVERS, WISCONSIN,
Aamund Salveson.
Water and Sewage Works, p 142-152, May 1970. 4 fig, 15 ref.

Descriptors: *Phosphates, *Water pollution sources, *Sampling, Rivers, Fish kills, Biodegradation, Fertilizers, Municipal wastes, Wisconsin.
Identifiers: *Fox River (Wis), *Wolf River (Wis), Poly-phosphates, Ortho-phosphates.

Analyses of the surface water samples of the two rivers included determinations of soluble orthophosphate, total and polyphosphates, pH value, filterable residue, and temperature. The Wolf River showed relatively low contents of total and orthophosphates, except in the Markton, New London, and Freemont sections, influenced by discharge of sewage or by fertilizer-enriched runoff. In spite of the abundance of algae and fish kills, filtered water of Lake Poygan was very low in phosphates suggesting their intensive fixation by phytoplankton. The Upper Fox River showed an extremely high concentration of phosphates (1.30 to 1.50 mg/l of phosphorus tetraoxide) near Fort Winnebago and the sewage outlet of the town Portage. The section from Montello to Omro preserved a rather high concentration of the total phosphates, but contained very small amount of orthophosphates (below 0.10 mg/l). The Fox River from Neenah to Green Bay exhibited only small variation in moderately high contents of both forms of phosphorus. (Wilde-Wisconsin)
W71-05392

LAKES: THE VALUE OF RECENT RESEARCH TO MEASURE EUTROPHICATION AND TO INDICATE POSSIBLE CAUSES,
Marine Dept., Rotorua (New Zealand). Fisheries Research Division.
For primary bibliographic entry see Field 05B.
W71-05401

EFFECTS OF DOMESTIC SEWAGE ON AQUATIC INSECTS AND SALMONIDS OF THE EAST GALLATIN RIVER, MONTANA,
Montana Cooperative Fishery Unit, Bozeman.
E. L. Avery.
Water Research, Vol 4, p 165-177, 1970. 2 fig, 7 tab, 17 ref.

Descriptors: *Rivers, *Water pollution effects, *Municipal wastes, Trout, Aquatic insects, Salmonids, Diptera, Montana.
Identifiers: *East Gallatin River (Mont), Sphaerotilus, Trichoptera, Ephemeroptera, Coleoptera, Plecoptera.

Sampling of aquatic insects and salmonids at the Bozeman municipal sewage outfall disclosed a depressing effect on the density of Trichoptera, Ephemeroptera, Coleoptera, and Plecoptera larvae. This effect was related to the occurrence of 'sewage fungus,' Sphaerotilus sp. A partial recovery of the insect community was observed at 3.85 miles below the outfall. At about 12.5 miles below the discharge, the fertilizing influence of diluted sewage raised the number of aquatic insects about 13 times above the normal. Rainbow, brown, and brook trout and mountain whitefish were found above the outfall, but only rainbow trout were present below the discharge beginning with the point where complete mixing of the sewage had occurred. The winter increase in ammonia nitrogen below the discharge reduced the standing crop of the trout. (Wilde-Wisconsin)
W71-05402

SOME EFFECTS OF TEMPERATURE ON SURVIVAL AND METABOLISM OF SELECTED ESTUARINE BIVALVES,
Rhode Island Univ., Kingston. Dept. of Zoology.
Victor S. Kennedy.
PhD thesis, 1970. 153 p, 26 fig, 22 tab, 48 ref, Append A, B, C, D, E. OWRR Projects A-002-MD (6) and A-011-MD (1).

Descriptors: *Metabolism, *Estuaries, *Clams, Water pollution effects, Maryland, Temperature, Respiration, Size, Weight, Acclimatization, Thermal water, Distribution, Latitudinal studies, Geographical regions, Benthos, Spawning, Salinity, Age, Computer programs.
Identifiers: *Bivalves, Compensatory adaptation, Patuxent Estuary (Md), Mya arenaria, Macoma balthica, Macoma phenax, Mulinia lateralis, Gemma gemma.

Significance of thermal discharge into the environment led to a study of Mya arenaria, Macoma balthica, Mulinia lateralis, Gemma gemma, and Macoma phenax, determining upper lethal temperatures. Sensitivity to slight temperature differences, probably reflected real physiological differences. Young Mya arenaria and Macoma balthica were more high-temperature tolerant than older clams of same species. Their vertical benthic distribution may be significant with relation to age and species differences. When Mya are killed by high temperatures, the more resistant Gemma may occupy the space. Resettlement of Mya would be prevented by larval Mya-adult Gemma competition. Spawning patterns of Mya and Macoma balthica in summer in Chesapeake Bay benthos could be affected by thermal discharge eliminating Mya and influencing interactions of Mya-Gemma. Respiration rate of Macoma balthica, Mulinia lateralis and Mya arenaria decreased with increasing size, and varied directly with temperature. Cold-acclimated Mulinia and Mya were metabolically depressed by high temperatures (30C), and low temperatures (1-2C) depressed or disrupted their metabolism while they were warm-acclimated. Even minor thermal loading of the benthos would elevate metabolism adversely. (Jones-Wisconsin)
W71-05406

A TECHNICAL ASSESSMENT OF CURRENT WATER QUALITY CONDITIONS AND FACTORS AFFECTING WATER QUALITY IN THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05407

SANITARY BACTERIOLOGY OF THE UPPER POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Donald W. Lear, and Norbert A. Jaworski.
Bacteriological water quality status report for January to March 1967. CTSL Technical Report No 6, MAR, March 1969. 39 p, 7 fig, 13 tab, 6 ref.

Descriptors: *Bacteria, *Coliforms, *E. Coli, *Salmonella, Indicators, Estuaries, Water pollution effects, Water pollution sources, Water quality.
Identifiers: *Potomac River estuary, Coliform indicator relationships.

Data on the bacteriological water quality of the upper Potomac Estuary are presented. Coliforms and fecal coliforms are considered to be useful as indicators of bacterial pollution. Major sources of coliform organisms in the upper estuary are waste water discharges, storm and combined sewers and freshwater inflows. The contribution of coliform organisms from waste water effluents is found to be hundredfold greater than from the freshwater inflow from the upper basin. No estimate was made of storm or combined sewer contributions. (Aalto-Chesapeake Technical Support Laboratory)
W71-05408

WATER QUALITY AND WASTE WATER LOADINGS UPPER POTOMAC ESTUARY DURING 1969,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05409

POTOMAC-PISCATAWAY DYE RELEASES AND WASTE WATER ASSIMILATION STUDIES,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05410

UPPER POTOMAC RIVER BASIN WATER QUALITY ASSESSMENT,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-05411

SALMONELLOSIS IN CATTLE,
Ministry of Agriculture, Fisheries and Food, Norwich (England). Veterinary Investigation Center.
For primary bibliographic entry see Field 05F.
W71-05433

FISH STORY ANADROMOUS; I.E.,
Canadian International Paper Co., Montreal (Quebec). Woodlands Research.
B. W. Fliger.
Science Affairs, Special Issue, Pesticides. . . are there alternatives, Vol 4, No 3, September 1970, p 47-49.

Descriptors: *Water pollution effects, *Pesticides, *DDT, *Salmon, *Spraying, Population.
Identifiers: Gaspe, Bay of Fundy (New Brunswick), Canada.

Large scale aerial spraying with modest doses of DDT insecticide over the budworm-infested forests of New Brunswick over a period of the past 16 years is traced. The effects of the insecticide have been successful for the trees, but in saving the forests, the network of rivers leading to the Bay of Fundy, the best remaining producers of the Atlantic Salmon, were infected by the insecticide. The effects the DDT has had on these salmon in all their various stages of several generations are outlined. (Ensign-PAI)
W71-05499

PARAMETERS AFFECTING THE GROWTH OF ULVA LATISSIMA IN A POLLUTED ESTUARY,
Northeastern Univ., Boston, Mass.
Thomas D. Waite, and Constantine Gregory.
North Eastern Regional Antipollution Conference, Annual, Proceedings, Kingston, Rhode Island, July 22-25, 1969, p 12-15.

Descriptors: *Estuaries, *Harbors, *Sewage, Water pollution effects, *Algae.
Identifiers: *Ulva latissima, *Ammonia nitrogen.

Ulva latissima, a marine flora that has produced severe pollution problems due to its unrestrained growth in estuaries and harbors as a result of domestic sewage fertilizing the marine environment was studied. The correlation between ammonia nitrogen concentration in seawater and rate of growth of Ulva latissima was investigated. The

greatest growth rate is realized at 0.7 mg/l ammonia nitrogen concentration. Reduction of ammonia concentration to less than 0.5 mg/l is necessary to regulate excessive growth of Ulva latissima. (Ensign-PAI)
W71-05500

MARINE CHEMICAL POLLUTANTS (METHODS OF STUDY AND RESULTS), (FRENCH),
Centre d'Etudes et de recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 05A.
W71-05501

MICROBIOLOGICAL DETERMINATION OF METHYL-MERCURY,
Aarhus Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 05A.
W71-05505

COMPUTER SIMULATION OF PHYTOPLANKTON GROWTH NEAR A MARINE SEWAGE OUTFALL,
Washington Univ., Seattle. Dept. of Oceanography.
R. C. Dugdale, and T. Whitledge.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 201-210, 1970. 4 fig, 5 ref.

Descriptors: Water pollution effects, *Sewage, *Outlets, *Phytoplankton, Growth rates, *Simulation analysis, Eutrophication, Nutrients.
Identifiers: *Euphotic zone, Diffuser system.

Feasibility of a euphotic zone diffuser system by a computer simulation model is presented. Nutrient limitation principles and the available kinetic constants for the uptake of ammonia and nitrate by phytoplankton along with chemical analysis of effluent composition are used. Maximum load per unit area of sea surface, current effects, incident radiation, effluent load and other variables can be studied with the model. (Ensign-PAI)
W71-05506

LATENT EFFECTS OF INSECTICIDE INTOXICATION TO MARINE MOLLUSCS,
Bureau of Sport Fisheries and Wildlife, Highlands, N.J.
Ronald Eisler.
Hydrobiologia, The Hague, The Netherlands, Vol 36, Issue 3-4, p 345-352, December 14, 1970. 3 tab, 15 ref.

Descriptors: *Mollusks, *Clams, *Gastropods, *Insecticides, *Fecundity, *Organophosphorus pesticides, DDT, Dieldrin, Endrin, Water pollution effects, Pesticides, Lethal limit.
Identifiers: DDVP, Dioxathion, Methyl parathion.

Mercenaria mercenaria and Nassa obsoleta were subjected to immersion in concentrations of 25 mg/l of four organophosphorus insecticides or 10 mg/l of four organochloride compounds at 24 parts per thousand, salinity and 20C. After 33 days it was noted that there was a reduction in number of egg cases deposited by the gastropods immersed in comparatively high concentrations of endrin, dieldrin and lindane. Low concentrations of p,p'-DDT, endrin, dieldrin and lindane seemed to stimulate gastropod fecundity. DDVP and methyl parathion in high concentrations decreased survival of both clams and gastropods. (Ensign-PAI)
W71-05508

EFFECTS OF MINERAL AND PETROLEUM EXTRACTION ON LIVING RESOURCES OF CONTINENTAL SHELF WATERS,
Washington Univ., Seattle.
James A. Crutchfield.
Gulf and Caribbean Fisheries Institute. Annual Session. Twenty First Proceeding, Miami, Florida, November 1968, University of Miami, Institute of Marine Sciences, Coral Gables, Florida, p 20-37, 1969. 7 tab, 9 ref.

Descriptors: *Continental shelf, *Oil industry, *Mining, Water pollution effects, *Commercial fishing, Oil wastes, Aquatic environment.

Most of the fish caught in North American waters are taken from the continental shelf areas where interference or pollution from oil production and mining of minerals would significantly affect the American fishing industry. Current information on actual and potential production of fish and shellfish from the continental shelf of the United States is summarized. Conflicts which may arise between the mining industries and the fishing industries are discussed and qualitative evaluations of the indirect effects stemming from petroleum and mineral activity in offshore waters which might be of interest to seafood producers are mentioned. (Ensign-PAI)
W71-05510

ECOLOGICAL INVESTIGATIONS AROUND SOME THERMAL POWER STATIONS IN CALIFORNIA TIDAL WATERS,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
James R. Adams.
United States International Biological Program, Thermal Workshop, Second Proceedings, Solomons, Maryland, November 3-7, 1968, Chesapeake Science, Vol 10, No 3/4, p 145-154, September-December, 1969. 13 fig, 13 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Cooling, *California, *Coasts, Water pollution sources, Temperature, Ecology, *Tidal water.

Biological implications within known physical parameters at operation powerplants are discussed. A cooling water system for a steamplant is described, with possible variations of the design for intake and discharge. Review of some thermal studies at Pacific Gas and Electric Company powerplants in California are presented. Before a site is developed by P. G. and E., consultations and agreements with state resource agencies and conservation authorities are considered. Temperature predictions and ecological studies are done to predict effects of the plant on the ecosystem. (Ensign-PAI)
W71-05512

DISPOSAL, DISTRIBUTION AND EFFECTS OF ORGANIC AND INORGANIC CHEMICAL WASTE IN THE MARINE ENVIRONMENT,
Oslo Univ. (Norway). Inst. of Marine Biology.
Ernst Foyn.
Revue Internationale D'Occanographie Medicale, Vol 17, p 51-66, 1970. 2 tab, 3 fig, 3 ref.

Descriptors: *Chemical wastes, *Waste disposal, *Distribution patterns, Water pollution effects, Solubility.

Organic and inorganic waste disposal is an increasing problem all over the world. Concentration of the pollutant; physical, chemical and biological properties of the pollutant; solubility of the disposed material; and the ionic composition, strength, and pH of the recipient seawater are all factors to be considered in evaluating and predicting the effects of waste on the environment. Treating waste before disposal and chemical and biological methods for control after disposal are considered. (Ensign-PAI)
W71-05517

MANGANESE CONTENT AND THE OCCURRENCE OF FALLOUT 54MN IN SOME MARINE BENTHOS OF THE MEDITERRANEAN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco); and Centre Scientifique de Monaco, Monte Carlo. Laboratoire de Radio-Activite Appliquee.
Walter Chipman, and Jean Thommeret.
Bulletin de l'Institut Oceanographique, Vol 69, No 1402, 1970. 15 p, 1 tab, 2 fig, 15 ref.

Descriptors: Water pollution effects, *Manganese, *Fallout, *Benthos, Radioactivity effects, Water pollution sources.
Identifiers: *Concentrations, *Occurrence, Distribution, Mediterranean Sea.

Marine benthos of the Mediterranean were investigated for accumulation of 54Mn. The manganese content of certain species of marine organisms and the distribution in the various organs and tissues were observed. The ascidian Halocynthia papillosa, the lamellibranch mollusc, Pinna nobilis, and the annelid worm, Hermione hystrix all showed high 54Mn content. Detectable amounts of 54Mn were found in the ash of the tube worm, Spirographis spallanzani. In Pinna the highest concentration of 54Mn was in the hepatopancreas. In polychaete worms concentrations were found in the external body structures. Although high radioactivity from fallout 54Mn was usually related to high manganese content in the organism, the specific activity of 54Mn varied. Among fallout radionuclides, 147 Pm seemed to be present in those organisms that concentrate 54Mn. (Ensign-PAI)
W71-05518

BACTERIOLOGICAL STUDIES IN THE BAY OF NAPLES,
Indiana Univ., Indianapolis. Dept. of Microbiology.
T. D. Brock.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 159-163, 1970. 1 tab, 3 ref.

Descriptors: Pollutants, *Bacteria, *Mollusks, *Marine plants, Ecology, Water pollution effects.
Identifiers: Epiphyte, Spirochete, *Bay of Naples.

The ecology of Leucothrix mucor and Cristispira were studies in the Bay of Naples. Leucothrix mucor is an epiphyte and is found throughout the Bay. Studies were conducted in relatively pollution-free Ischia and Sorrento and in the polluted waters at Naples between Santa Lucia and Mergellina. Cristispira is a spirochete living in some species of molluscs found in the Bay of Naples. The Bay, though very polluted, was found to still be suitable for the survival of clean water organisms such as Cristispira and Leucothrix. (Ensign-PAI)
W71-05520

THE INFLUENCE OF THE RIVER TYNE ON THE BACTERIOLOGICAL AND CHEMICAL QUALITY OF INSHORE WATERS OF THE NORTH EAST COAST OF ENGLAND,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. C. Head, and A. James.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 147-158, 1970. 3 tab, 13 ref.

Descriptors: *Water pollution effects, *Rivers, *Estuaries, *Chemical analysis, *Bacteria, Coliforms, Nutrients, Phytoplankton, Seasons.
Identifiers: Inshore waters, England (North East Coast), *River Tyne.

Chemical and bacteriological surveys have been conducted to determine the effect of domestic and industrial waste discharge on the waters near the mouth of the River Tyne in England. Coliform and Escherichia coli counts have shown that despite die-off and dilution surface layers contain significantly higher numbers of bacteria. The amount of nutrient elements discharged by the river per day is 1000 Kg of nitrogen and silicon, and 100 Kg of phosphorous. During the winter months there was an increase of these elements in the inshore waters. During spring and summer phytoplankton growth resulted in the removal of all the nutrients in the surface waters not directly influenced by the river discharge. In discharge areas higher levels of nutrients and higher standing crops of phytoplankton were found. (Ensign-PAI)
W71-05523

MICROORGANISMS GROWING IN OIL AND OIL PRODUCTS IN WESTERN AND CENTRAL REGIONS OF THE MEDITERRANEAN SEA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
O. G. Mironov.
Revue Internationale D'Oceanographie Medicale, Vol 17, p 79-85, 1970. 2 tab, 1 fig, 8 ref.

Descriptors: *Oil, *Microorganisms, *Bacteria, *Water pollution effects, Self-purification.
Identifiers: *Mediterranean Sea.

Composition and distribution of species of microorganisms growing in oil and oil products in the Mediterranean were studies. Bacterial growth was effected at 27 degrees C and was observed in 28 out of 54 seawater samples. Thirty nine cultures were separated belonging to the genera Pseudobacterium, Micrococcus, Pseudomonas, Bacterium, and Bacillus. Crude oil and diesel oil were used as the only source of carbon. Relationship was then noted between oil pollution of sea water and occurrence of microorganisms growing in oil and oil products. (Ensign-PAI)
W71-05524

SOME BIOGEOCHEMICAL CONSIDERATIONS ON THE RADIOACTIVE CONTAMINATION OF MARINE BIOTA AND ENVIRONMENTS,
International Laboratory of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05A.
W71-05531

THE DIFFUSION OF BACTERIAL POLLUTION IN THE SEA,
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, P. Koch, and J. Garancher.
International Conference on Water Pollution Research, Fourth, Proceedings, Prague, Czechoslovakia, April 21-25, 1969, Pergamon Press, New York, p 793-809, 1969. 2 fig, 1 tab, 33 ref.

Descriptors: *Domestic wastes, *Bacteria, *Plankton, *Biomass, *Balance of nature, *Sewage, *Self-purification, Water pollution sources, Water pollution effects.

Investigations were made concerning the diffusion of bacterial pollution in the marine environment. It was deduced that the discharges of domestic waste water into a reconstituted marine environment affect the growth of the planktonic biomass favorably, even when the sewage rate is as high as 20%. At high concentrations these discharges slightly modify the ecological balance and tend to favor the efflorescence of protozoa. Antibiotic action caused by increased planktonic forms has proved to be greater than the bacterial growth enriched with sewage, and this eventually results in their total destruction. (Ensign-PAI)
W71-05547

THE BEHAVIOUR OF BACTERIA IN THE PRESENCE OF PRODUCTS RELEASED BY MARINE PHYTOPLANKTON,
Centre Hospitalo-Universitaire-Poitiers (France).
J. Brisou.
International Conference on Water Pollution Research, Fourth, Proceedings, Prague, Czechoslovakia, April 21-25, 1969, Pergamon Press, New York, p 783-791, 1969. 1 tab, 24 ref.

Descriptors: *Self-purification, *Phytoplankton, *Aerobic bacteria, *Anaerobic bacteria, *Marine plants, Water pollution effects, Metabolism.
Identifiers: Assimilation (Plants).

The possible relationships between phytoplankton and the acrobic and anaerobic microbial populations that exist in the marine environment are studied. This paper specificly discusses experiments relating to the part played by phytoplankton in the self purification of sea water. Marine plants assimilate and reject the products of metabolism, and contain rather characteristic substances. Those products that are apt to be released into the environment and those that are contained within the tissues and can only be released by physical disintegration or by lysis are considered separately. (Ensign-PAI)
W71-05549

NUTRIENT STUDIES IN HYPER-FERTILIZED ESTUARINE ECOSYSTEMS: I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
Walter Abbott.
International Conference on Water Pollution Research, Fourth, Proceedings, Prague, Czechoslovakia, April 21-25, 1969, Pergamon Press, New York, p 729-746, 1969. 2 fig, 6 tab, 41 ref.

Descriptors: *Estuaries, *Pollutant identification, *Nutrients, *Ecosystems, *Model studies, Water pollution effects, Estuarine environment.

Metamorphic data, pond salinities, nutrient levels, P32 distribution and other data were tabulated from a model ecosystem. Eighteen experimental ponds were made by capturing a small bayou channel with cross-levees. This allowed an established estuarine bottom to form in the ponds. Pond volumes were determined by a dye-dilution technique using sodium fluorescein and a fluorimeter. Addition of nutrients, tracers, etc., were made from a skiff with an outboard motor which, when driven in a circular path in the center of the pond stirred the water without disrupting the sediments. (Ensign-PAI)
W71-05550

ESTIMATION OF THE MAXIMUM DOSE TO MAN FROM THE CONTAMINATION OF AN AQUATIC ECOSYSTEM WITH RADIONUCLIDES,
California Univ., Livermore. Lawrence Radiation Lab.
Arthur R. Tamplin.
Biological Implications of the Nuclear Age, Symposium. Proceedings, Livermore, California, March 5-7, 1969, AEC Lawrence Radiation Laboratory, Bio-Medical Division, Oak Ridge, Tenn, p 77-94, Dec 1969. 2 tab, 1 fig, 19 ref.

Descriptors: *Radioactivity effects, *Ecology, *Aquatic life, *Public health, Aquatic environment, Radioisotopes, Water pollution effects.
Identifiers: Maximum dose estimates.

A method for estimating the maximum internal dose to man, as a possible result of radionuclides released into an aquatic environment is discussed. With this method the nuclides that could contribute most to the internal dose, and determination of the contribution of each nuclide to the total dose, can be identified. The basic objectives of preshot radiation safety analysis and guidance for postshot documentation are accomplished by the results of this method. The analysis is useful as a guide for device design. (Ensign-PAI)
W71-05552

WATER RESOURCES POTENTIAL OF AN URBAN ESTUARY (SAUGUS RIVER, PINES RIVER AND LYNN HARBOR COMPLEX),
Northeastern Univ., Boston, Mass. Dept. of Civil Engineering; and Northeastern Univ., Boston, Mass. Dept. of Environmental Science.
John J. Cochrane, Constantine J. Gregory, and Gerald L. Aronson.
Available from NTIS as PB-197 991, $3.00 in paper copy, $0.95 in microfiche. Massachusetts Water Resources Research Report, June 1970. 83 p, 29 fig, 7 tab, 44 ref. OWRR Project A-028-Mass (1).

Descriptors: *Estuaries, *Water pollution effects, *Water resources development, *Massachusetts, *Eutrophication, Nutrients, Algae, Phosphates, Nitrates, Surveys, Pesticides, Waste disposal, Pollutants, Water quality.
Identifiers: *Boston (Mass), Lynn Harbor (Mass).

The water resources potential of the urban estuarine complex comprised of the Saugus and Pines Rivers and Lynn Harbor, Massachusetts, was evaluated. Impairment of recreational usage is caused by eutrophication resulting from raw waste discharges and nutrient reserves in sediments. A laboratory study of the growth of marine algae Ulva latissima, made in flowing sea water, indicates an optimum growth at nitrogen-phosphorous ratios of between 40 and 60 to 1, at a phosphate concentration of 120 micrograms per liter. Average values for nutrients in eutrophic areas were 268 micrograms/liter total orthophosphate and 0.513 mg/l nitrates. Sediments from these areas averaged 5.98% volatile solids, 0.532 mg/l extracted orthophosphates, and 2.177 mg/l total Kjeldahl nitrogen. In contrast, oligotrophic areas, including parts of the Pines River, had averaged values of 16 micrograms/l total orthophosphate, 0.175 mg/l nitrates, 0.79% volatile solids, 0.349 mg/l extracted orthophosphates and 0.294 mg/l total Kjeldahl nitrogen. (Knapp-USGS)
W71-05553

WATER QUALITY AND ITS EFFECT ON WHITE FABRICS,
North Dakota State Univ., Fargo. Coll. of Home Economics.
Janice I. Buckner, and Coila M. Janecek.
Farm Research, Vol 28, No 1, p 18-21, September-October 1970. 4 p, 2 fig. OWRR Project A-020-NDAK (2).

Descriptors: *Water pollution effects, *Cleaning, *Textiles, *Detergents, *Water quality, Color, Soaps, Hardness (Water), Iron, Manganese, Alkalinity, Acidity, Testing, Test procedures, Evaluation.
Identifiers: *Laundering, *Water quality effects, *Fabric staining.

This study was designed to identify factors in water that cause discoloration of white fabrics and to determine if these factors have other damaging effects on the fabrics such as loss of strength. The Kindred area of Cass County, North Dakota, was selected for the study. Water in this area is hard and contains iron and manganese in sufficient quantity to cause staining of white fabrics. All cold and hot water supplies were found to have pH values between 7.0 and 8.8. A Photovolt reflection meter was used to determine the whiteness of the unlaundered swatches and to measure the amount of discoloration of the laundered swatches. The swatches showing the greatest increase in percent of yellowness were laundered in moderately to very hard water. In order to determine if the minerals in solution had been detrimental to the fabric, tests were made for breaking strength. After 20 launderings, all but two swatches showed a decrease in fabric strength in the length-wise (warp) direction. The swatches having the greatest decrease in fabric strength had been laundered in hot water classified as very hard or over 10.5 grains per gallon of hardness. There was no significant difference between waters samples in the fall, winter and spring. (Woodard-USGS)
W71-05617

SEDIMENT-WATER NUTRIENT RELATIONSHIPS - PARTS 1 AND 2,
Federal Water Quality Administration, Cincinnati. Field Investigations Branch.
For primary bibliographic entry see Field 05B.
W71-05626

SOME ALGAE OF THE UPPER CUYAHOGA RIVER SYSTEM IN OHIO,
Kent State Univ., Ohio. Dept. of Biological Sciences.

For primary bibliographic entry see Field 05A.
W71-05629

BANGIA ATROPURPUREA (ROTH) A. IN WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W71-05630

BIOASSAY PROCEDURES FOR OIL AND OIL DISPERSANT TOXICITY EVALUATION,
National Marine Water Quality Lab., Kingston, R.I.
Gilles LaRoche, Ronald Eisler, and Clarence M. Tarzwell.
Journal Water Pollution Control Federation, Vol 42, No 11, p 1982-1989, November 1970. 1 fig, 5 tab, 9 ref.

Descriptors: *Bioassay, *Toxicity, *Oil drilling, Annelids, Crustaceans, Seawater, Hydrogen-ion concentration, Salinity, Dissolved oxygen, Oil wastes.
Identifiers: Cyprinodontiform teleosts, Crude oil.

Laboratory procedures are listed for the determination of relative 96-hr toxicities of crude oils, oil-spill removers, and oil-dispersant mixtures to representative cyprinodontiform teleosts, polychaete annelids, and decapod crustaceans. (Little-Battelle)
W71-05632

NTA,
Children's Cancer Research Foundation, Inc., Boston. Lab. of Environmental Toxicology; and Children's Cancer Research Foundation, Inc., Boston. Lab. of Carcinogensis.
Samuel S. Epstein.
Environment, Vol 12, No 7, p 2-11, September 1970.

Descriptors: *Detergents, *Phosphates, *Water pollution treatment, *Toxicity, Acids, Eutrophication, Chelation, Water pollution effects, Sewage, Reduction (Chemical), Nutrients.
Identifiers: Nitrilotriacetic acid, Carcinogens, NTA.

The substitution of NTA for phosphates in detergents may pose problems greater than the eutrophication associated with the use of phosphates. NTA potentially may cause kidney damage, may chelate metal ions and thereby damage many types of equipment, or may degrade into secondary amines and become carcinogenic. (Little-Battelle)
W71-05639

RESIDUES IN FISH, WILDLIFE AND ESTUARIES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05B.
W71-05643

UTILIZATION OF ALKOXYSILANES FOR REDUCTION OF THE ABUNDANCE OF PHYTOPLANKTON DURING 'BLOOMS' OF WATER BASINS (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05F.
W71-05719

THE PROBLEM ON THE FARM: ANIMAL HEALTH,
Ministry of Agriculture, Fisheries and Food, Norwich (England). Veterinary Investigation Service.
J. A. J. Venn.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 4, p 24-29, 1970. 41 ref.

Descriptors: *Toxicity, *Hazards, *Diseases, Farm wastes, Copper, Nitrogen, Potash, Lagoons, Slurries, Animal diseases, Bacteria, Viruses, Pathogenic bacteria.
Identifiers: United Kingdom, Toxic gases, Toxic chemicals, Parasites, Contamination, Health.

Health hazards associated with farm wastes have attained prominence with the development of intensive systems of husbandry. Whilst certain of the problems are unique to intensive systems, most of them are not new. This paper is an attempt to indicate some of them. An account is given of certain hazards to animal health arising from farm wastes, notably slurry and toxic chemicals. Possible ways of limiting these hazards are suggested. A discussion of the paper follows. (See also W71-05747). (Christenbury-Iowa State)
W71-05751

FARM WASTES: PUBLIC HEALTH AND NUISANCE PROBLEMS OFF THE FARM,
Chelmsford Rural District (Essex). Chief Health Inspector.
For primary bibliographic entry see Field 05F.
W71-05752

MONITORING OF THE MARINE ENVIRONMENT FOR WASTE COMPONENTS AND FOR EFFECTS OF THE INTRODUCED WASTES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-05789

PHYSICAL EFFECTS ON RECEIVING WATERS,
California Univ., Berkeley. Dept. of Civil Engineering.
Robert E. Selleck.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy on Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p VIII 1-VIII 6.

Descriptors: *Wastes, *Waste water, *Environment, *Oil wastes, Water pollution sources, Water pollution effects.
Identifiers: *Receiving waters, *Surface materials, Surface phenomena, Interfacial phenomena.

The surface or interfacial problems due to foreign matter discharged into the marine and estuarine environment are explained. Films, lenses, scum, foam, and detritus are some of the forms of this surface material. These materials are classed as monolayers and duplex films and the actions, formation, physical effects and approximate relationships of these films are discussed. Natural sea slicks, surface materials of waste water origin and interfacial phenomena are mentioned with suggestions for future investigations on the physical effects of foreign substances on receiving waters. (See also W71-05787) (Ensign-PAI)
W71-05795

CHEMICAL AND GEOCHEMICAL EFFECTS ON RECEIVING WATER,
Alaska Univ., College. Inst. of Marine Sciences.
Donald W. Hood.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p IX 1-IX 45. 4 tab, 41 ref.

Descriptors: *Chemical properties, *Geochemistry, *Wastes, *Sediments, Pesticides, Absorption, River flow, Mining, Oil, Nutrient requirements.
Identifiers: *Receiving waters, *Waste effects.

Man's capacity to destroy the 'inexhaustable' oceans is at last being realized. The cycles in the oceans are very slow. What was predicted as safe a few years ago is no longer proving valid. With this in mind the author discusses some chemical and geochemical effects on receiving water. Chemical properties of waste components affecting their absorption on organic and inorganic particulates and sediments, pesticide uptake by suspended inorganic materials and organic particulate and the exchange coefficients for the sediment - water interface affecting cycling of waste components are included. He also discusses the role of river inflow and chemical scavengers of waste components in the sea, mineral harvesting on chemical character of continental shelf waters and sediments, and the nutrient budget of oceans and estuaries. (See also W71-05787) (Ensign-PAI)
W71-05796

CHEMICAL AND GEOCHEMICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT, AND CHEMICAL AND GEOCHEMICAL EFFECTS ON THE RECEIVING WATERS,
California Inst. of Tech., Pasadena; and Pomeroy, Johnston, and Bailey, Pasadena, Calif.
For primary bibliographic entry see Field 05B.
W71-05797

BIOLOGICAL EFFECTS OF WASTE DISCHARGES ON COASTAL RECEIVING WATERS,
Engineering-Science, Inc, Forest Hills, N.Y.; and Engineering-Science, Inc., Arcadia, Calif.
Neal E. Armstrong, and Philip N. Storrs.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XII 1-XII 40. 2 tab, 49 ref.

Descriptors: *Wastes, *Aquatic life, *Standing crop, *Productivity, *Bioindicators, *Pesticides, *Toxicity, Analytical techniques, Data processing, Application methods.
Identifiers: Microplankton, Zooplankton, Benthic animals, Large invertebrates, Fish, Diversity indices, Biostimulation, Receiving waters.

Background for discussion of the biological effects of waste materials on receiving waters is presented. Quantitative as well as qualitative data is needed in sampling methods. Identification of biological components and determination of numbers per unit area and/or per unit volume of water are of concern. Microplankton, zooplankton, benthos, large invertebrates, fish and microbes are catagorized in this way. Parameters for biological community structure and response are described by standing crop, productivity, diversity indices and indicator organisms. Analytical methods, data processing and application for biota quantification and community structure parameters are described. Assessment and allowable concentrations for toxicity; model prototype simulation, theory and rationale, and kinetics of biostimulation; and definition, problems, exposure, analytical methods, sources, transport, decay and treatment of pesticides are outlined. Existing knowledge is assessed and objectives for further investigations proposed. (See also W71-05787) (Ensign-PAI)
W71-05799

BIOLOGICAL EFFECTS ON RECEIVING WATERS,
Maryland Univ., Solomons. Natural Resources Inst.
Eugene L. Cronin.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XIII 1-XIII 25. 37 ref.

Descriptors: *Wastes, *Toxicity, *Biology, *Monitoring, *Organic compounds, *Inorganic compounds, Pathogenic bacteria, Public health.
Identifiers: *Field tests, Laboratory tests.

The partial assessment of toxicity and estimation of allowable concentrations in receiving waters are discussed with emphasis on the magnitude and gravity of our limitations. Before and after surveys, disposal site and control site comparisons, pre-planned site-and-'control' comparisons and wide scale biological monitoring along with laboratory studies were conducted. The possibilities and difficulties involved in biostimulation by inorganic and inorganic wastes and assay of biostimulatory effects are considered. Health risks from pathogens and quantitative measures of community health are mentioned. (See also W71-057877) (Ensign-PAI)
W71-05800

BIOLOGICAL PROCESSES WHICH INTERACT WITH AND INFLUENCE THE DISTRIBUTION OF WASTES INTRODUCED INTO THE MARINE ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W71-05801

BIOLOGICAL EFFECTS ON RECEIVING WATERS: THE PLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. D. H. Strickland.
Background Papers on Coastal Wastes Management, prepared for National Academy of Sciences Committee on Oceanography and the National Academy of Engineering Committee on Ocean Engineering, Wash, DC, Vol 1, 1969, p XVII 1-XVI 23. 39 ref.

Descriptors: *Wastes, *Waste water disposal, *Environmental effects, Biology, Ecology, Toxicity, Plankton, Eutrophication.

The reactions of plants and animals to changes in the environment caused by man's activities are considered. A decision as to what is beneficial use of our coastal waters must be made in order to know to what extent their use is being jeopardized. Measuring the biota and its environment in time and space to establish a norm is essential in proving pollution. Twelve months of monitoring of the environment before introducing the foreign matter is necessary. Methods for measuring the biota and the environment, waste water disposal and toxicity assessment are presented. The biology which underlines the phenomena of eutrophication in the sea and effects on the plankton are discussed. (See also W71-05787) (Ensign-PAI)
W71-05803

STUDY OF AN ECOSYSTEM IN THE COASTAL WATERS OF THE LIGURIAN SEA, III. MACROBENTHIC COMMUNITIES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
Gilat Eliezer.
IAEA Radioactivity In The Sea, Publication No 27, 1969. 76 p, 7 fig, 6 tab, 64 ref.

Descriptors: *Ecosystems, *Benthos, *Biomass, *Radioactivity effects, Radionuclides, Food chains, Absorption, Water pollution effects.
Identifiers: *Biocenosis, *Ligurian Sea, Bay of Lion, Adriatic Sea, Mediterranean Sea, North East Atlantic.

Benthic communities on the continental shelf off Monaco were studied. The area and methods of sample collection are described. Biocenosis of the infralittoral and circalittoral shelves in the Bay of Roquebrune and adjacent areas are studied. Discussion of the biomass and benthic communities of the Mediterranean Sea, Adriatic Sea and the North East Atlantic are discussed and compared with those of the Bay of Roquebrune. (Ensign-PAI)
W71-05809

THE EFFECTS OF THERMAL EFFLUENT ON SOME OF THE MACROFAUNA OF A SUB-TROPICAL ESTUARY,
Florida Power and Light Co.
Richard S. Nugent, Jr.
University of Miami, Sea Grant Program, (Estuarine and Coastal Studies), Sea Grant Technical Bulletin, Number 1, August 1970. 198 p, 29 fig, 19 tab, 145 ref. Sea Grant Technical Bulletin Number 1.

Descriptors: *Estuaries, *Thermal pollution, *Ecology, *Marine animals, Water pollution effects, Florida, Environmental effects.
Identifiers: Turkey Point, *Biscayne Bay.

The effects of heated discharge water from an electric generating facility on the populations of some macrofauna in the waterways of the mangrove region of Biscayne Bay were studied. Qualitative and quantitative investigations were conducted on the kinds, distribution, and abundance of several species of fishes and invertebrates. Hydrological parameters were monitored routinely throughout the study area. Decreased abundance of many species along with other factors indicated that the thermal effluents were detrimental to the animal populations of the area. (Ensign-PAI)
W71-05811

5D. Waste Treatment Processes

STATE OF THE ART REVIEW ON SLUDGE INCINERATION PRACTICE,
Resource Engineering Associates, Wilton, Conn.
S. Balakrishnan, D. E. Williamson, and R. W. Okey.
Copy available from GPO Sup Doc as I67.13/4:17070 DIV 04/70, $1.25; microfiche from NTIS as PB-197 888, $0.95. Water Pollution Control Research Series, 17070, DIV/04/70, April 1970. 135 p, 20 tab, 40 fig, 61 ref. FWQA, Program 17070 DIV, 04-70.

Descriptors: *Incineration, *Sludge disposal, *Domestic wastes, Solid wastes, Dewatering, *Incineration, *Sludge disposal, *Domestic wastes, Solid wastes, Dewatering, Hydration, Colloids, Centrifugation, Sedimentation, Flotation, Detergents, Biochemical Oxygen Demand, Air Pollution, Waste disposal, Waste water treatment, *Sludge treatment, Reviews.
Identifiers: *Pretreatment, Thickening.

The current status of the incineration art and the associated costs are presented. Principal emphasis is placed upon sludge thickening, sludge conditioning, sludge dewatering, sludge incineration systems, and the design and operation of incinerators. The attitudes of state agencies and consulting engineering firms towards the design and operation of incinerators is included. Conclusions reached are: (1) on-site disposal in limited space requires developments far more efficient in disposing of solids; (2) much improvements in pretreatment steps is essential; (3) addition of other combustible materials may enhance the efficiency of combustion of sludge; and (4) although several systems are currently available there is great need for investigation and updating of the process methods. (Lowry-Texas)
W71-05384

ELECTROOSMOTIC PUMPING FOR DEWATERING SEWAGE SLUDGE,
North American Rockwell Corp., Canoga Park, Calif. Rocketdyne Div.
Jerome Greyson.
Copy available from GPO, Sup Doc as I67.13/4:ORD-17070 EHE 07/70, $0.65; microfiche from NTIS as PB-197 889, $0.95. Water Pollution Control Research Series, ORD 17070 EHE 07/70, July 1970. 59 p, 17 tab, 17 fig, 9 ref, 2 append. FWQA Program 17070EHE.

Descriptors: *Electroosmosis, *Dewatering, *Sewage sludge, Incineration, Membrane processes, Osmosis, Separation techniques, *Wastes water treatment.
Identifiers: *Electroosmotic pumping.

An experimental program was conducted to determine equipment configurations for efficient solid removal, identification of critical parameters involved in the efficiency of electroosmotic pumping and the design and testing of two prototype electroosmotic pumps. It was determined that electroosmosis can be applied to dewatering waste sludges of various types. For efficient dewatering from very wet sludge (2%) to burnable solids, it is necessary to orient the pumping apparatus with a cathode screen beneath the anode so that an initial sludge film can be formed by gravity settling at the cathode surface. Sludge cannot be thickened to a solids level exceeding 20% if the cake is beneath the liquid level of the sludge suspension and for drying beyond the 20% value, the cake must be brought out of the liquid. (Ellis-Texas)
W71-05385

ADVANCED WASTE WATER TREATMENT USING POWDERED ACTIVATED CARBON IN RECIRCULATING SLURRY CONTRACTOR CLARIFIERS,
Infilco, Tucson, Ariz.
C. F. Garland, and R. L. Beebe.
Copy available from GPO Sup Doc as I67.13/4:ORD-17020EKB07/70, $0.75; microfiche from NTIS as PB-197 890, $0.95. Water Pollution Control Research Series ORD-17020 FK 07/70, July 1970. 81 p, 10 tab, 31 fig, 10 ref, append. FWQA Program 17020 FKB.

Descriptors: *Activated carbon, *Solids contact process, *Slurries, Pilot plant, Adsorption, Flocculation, Organic loading, Biochemical oxygen demand, Chemical Oxygen demand, *Tertiary treatment, *Waste water treatment, Sludge treatment, Activated sludge.
Identifiers: *Activated sludge plant effluent, *Polyelectrolytes, *Clarifier, Regeneration, Recirculation, Counter-current flow, Hydraulic loading.

Pilot-scale studies dealing with the use of recirculating-slurry solids-contact clarifiers in treating activated sludge plant effluent were studied. Evaluation of all available materials led to selection of Darco S-51 activated powdered carbon and Purifloc C-32 polyelectrolyte flocculating agent, with 6 to 7 mg/l of polyelectrolyte required at a carbon feed rate of up to 140 mg/l. 30% greater carbon efficiency, as opposed to a single stage conventional unit, was achieved with a single slurry unit, while results for two series clarifiers were comparable to that of two conventional counter-current adsorption systems requiring multiple agitated tanks, clarifiers, and filters. Hydraulic loading rates ranged from 0.4 to 1.6gpm/ft sq and influent BOD ranged from 23 to 34 mg/l. Dual stage counter-current contactors with 67, 146, and 266 mg/l of carbon achieved 60, 72' and 84 per cent COD reduction with residuals of 10.3, 7.4 and 4.4 mg/l respectively. Estimated costs for a 10 mgd plant with 240 mg/l and 8 mg/l dosages of carbon and polyelectrolytes respectively are 15 cents/1000 gal for a 10 mgd plant, and 12.7 cents/1000 gal for a 100 mgd plant. Further cost reductions could be possible in the event that effluent quality restrictions would allow a decrease in the carbon dosates. (Lowry-Texas)
W71-05386

MATHEMATICAL MODEL OF RECALCINATION OF LIME SLUDGE WITH FLUIDIZED BED REACTORS,
General American Transportation Corp., Niles, Ill.
G. J. Ducar, and P. Levin.
Copy available from GPO, Sup Doc as I67.13/4:ORD17090 EHQ 09/70, $0.55; microfiche from NTIS as PB-197 891, $0.95. Water Pollution Control Research Series, ORD17090 EHQ 09/70, Sept 1970. 49 p, 1 tab, 14

fig, 36 ref. I67.13/4:ORD 17090EHQ0970. FWQA Program 17090 EHQ.

Descriptors: *Computer programs, *Computer models, *Lime, Mathematical models, Hydration, Calcium Carbonate, Water softening, *Pulp wastes, *Tertiary treatment, Sludge treatment, *Waste water treatment.
Identifiers: *Recalcination, Fluidized bed, Cyclone, Calcium oxide.

A computer program, based on data collected from a literature review and from actual plant operation of pulp mills and a water softening plant, has been developed to evaluate lime sludge recalcination operations. Since fluidized bed reactor have not yet been installed commercially, no data was available. The models developed represent the recalcination process as applied to tertiary treatment plants. This program was designed for use as a subroutine in the executive program, 'Preliminary Design of Waste water Treatment Systems,' which is used to optimize and evaluate new waste water treatment systems to be funded by the FWQA. (Lowry-Texas)
W71-05387

THE DEVELOPMENT OF A FLUIDIZED-BED TECHNIQUE FOR REGENERATION OF POWDERED ACTIVATED CARBON,
Battelle Memorial Institute, Columbus, Ohio. Columbus Labs.
A. K. Reed, T. L. Tewksbury, E. A. Wasto, J. G. Price, and G. R. Smithson, Jr.
Copy available from GPO Sup Doc as I67.13/4:ORD-17020FBD 03/70, $0.55; microfiche from NTIS as PB-197 892, $0.95. Water Pollution Control Research Series, ORD-17020 FBD 03-70, March 1970. 43p, 15 tabs, 17 fig. FWQA Program 17020 FBD.

Descriptors: *Activated carbon, *Adsorption, Sewage treatment, Tertiary treatment, Solids contact process, *Waste water treatment.
Identifiers: *Fluidized-bed, *Regeneration.

Results of research conducted as the Columbus Laboratories of Battelle Memorial Institute on the regeneration of spent powdered carbon is described. The study was directed toward the development of a fluidized-bed regeneration technique in which two systems were investigated. One was a system in which the dried spent carbon was regenerated during its passage through a fluidized-bed of inert material while the other system consisted of a pulsating fluidized-bed system in which the finely divided regenerated carbon served as the bed material. Although both systems restored the spent powdered carbon to 90% of its original adsorptive capacity and recovered 80% by weight, the fluidized inert bed was chosen for larger scale development because of its higher unit capacity. A pilot-scale unit was designed and constructed to process 30 pounds of spent carbon in an 8 hour period. This unit was integrated in a powdered carbon adsorption process and tested for 23 days. The results indicated that regenerated carbon was as effective as virgin carbon for organic removal for at least 3.6 cycles through the system. An economic analysis indicated that operating costs would be about 1 cent per pound for a commercial plant producing 20,000 pounds of regenerated carbon per day. (Ellis-Texas)
W71-05388

OPTIMIZING LIPID BIOSTABILIZATION,
Midwest Research Inst., Kansas City, Mo.
W. Garner.
Copy available from GPO Sup Doc as I67.13/4:ORD-17050FIMDS170, $0.60; microfiche from NTIS as PB-197 893, $0.95. Federal Water Quality Administration, Water Pollution Control Series, ORD-17050 FIM 05/70, May 1970. 57 p, 14 tab, 11 fig, 23 fig, 2 append. FWQA Program 17050 FIM.

Descriptors: *Optimization, *Lipids, *Anaerobic conditions, Digestion, Anaerobic digestion, Degradation, Lime, Chemical oxygen demand, *Waste water treatment.
Identifiers: *Biostabilization, Homogenization, Buffers.

Laboratory scale anaerobic digestion studies were carried out to determine the effect of high-shear mixing on the degradation of lipids. The studies showed that the intensity of mixing must be carefully tailored to the rate and type of feed if benefits are to be realized. Dog food, cottonseed oil, and motor oil were fed to the digesters daily as slug loads. When properly operated, the 15 replicate digesters gave reproducible results with good precision. High-shear mixing has little effect on degradation of dog food and was deleterious to lime-buffered solutions heavily loaded with cotton seed oil. When soda ash was used as a buffering agent, heavy loads of oil caused the digester to 'go sour' regardless of the mixing system. Under some conditions homogenization led to serious foaming in the digestors. Kinetic data and chemical analysis of drawdown samples confirmed the hypothesis that homogenization or soda ash buffering can accelerate the hydrolysis of a heavy load offat to a point where the saponification products over load the methane fermentation. Motor oil was not readily digested but did not appear to influence the digestion of cottonseed oil or dog food. Other observations were: (1) more rapid gasification occurs as the feed rate increases; (2) lime and soda ash cannot be used interchangeably as buffers; and (3) feed COD cannot be used to predict methane yield. (Ellis-Texas)
W71-05389

FAULKS V BOROUGH OF ALLENHURST (INSTALLATION OF SEWAGE TREATMENT PLANT ON PUBLIC ROAD EASEMENT).
For primary bibliographic entry see Field 06E.
W71-05403

CONTROL OF WATER POLLUTION FROM SOUTHWESTERN CATTLE FEEDLOTS,
Texas Tech Univ., Lubbock. Water Resources Research Center.
D. M. Wells, W. Grub, R. C. Algin, G. F. Meenaghan, and E. Coleman.
Proceedings, 5th International Water Pollution Research Conference, July-August 1970, Paper II-38. 19 p, 20 tab. FWPCA Demr. Grant 13040, Texas Water Quality Board Contr. IAC (68-69).

Descriptors: *Farm wastes, *Cattle, *Manure, *Runoff, Biochemical oxygen demand, Nutrients, *Acrobic treatment, Anaerobic digestion, Irrigation, Waste water treatment.
Identifiers: *Feedlot runoff, Plant toxicity.

The objectives were to determine the characteristics of solid and liquid wastes resulting from cattle feedlot operations in the southwest U.S., to determine the treatability of these wastes by aerobic and anaerobic treatment systems and to determine whether or not the wastes produced could be used in a beneficial manner for the growing of cash crops. The feedlots studied included concrete-surfaced lots, dirt-surfaced lots, and controlled environmental chambers located on the Texas Tech University campus. Among their conclusions were that within reasonable limits, quality of runoff was not materially affected by type of ration fed or quantity of precipitation. Treatment of runoff resulting from precipitation on beef cattle feedlots is not feasible by conventional treatment systems. Direct application of runoff from concrete-surfaced lots was highly detrimental to the crops they tested. Direct application of runoff from dirt lots had an inhibitory effect on most crops tested except Midland Bermuda grass. Storage of runoff in unlined ponds may result in substantial pollution of the groundwater in the vicinity. They concluded that liquid systems for handling cattle feedlot wastes were not feasible. (Miner-Iowa State)
W71-05412

EQUIPMENT FOR DISPOSAL OF AGRICULTURAL EFFLUENTS,
National Agricultural Advisory Service, London (England).
C. Culpin.
Chemistry and Industry, p 350-353, February 29, 1964. 3 ref.

Descriptors: *Farm wastes, *Disposal, Effluents, Slurries, Storage tanks, Silage, Distribution, Methane, Mixing, Distribution systems, Sprinkler irrigation, Pumps, Labor, Odor, Waste disposal, Waste water treatment.
Identifiers: Agitation, Vacuum pumping, Tanker.

Types and quantities of manure and other effluents are described, as well as systems and equipment for their disposal in Britain. Different storage methods and means of agitation or mixing are described. Four distribution systems are discussed. These include either some type of sprinkler irrigation or a tank wagon method. Labor requirements for both distribution methods, as well as future prospects are given. (White-Iowa State)
W71-05413

DISPOSAL OF FARM EFFLUENT,
Ministry of Agriculture, Fisheries and Food, Norwich (England). Veterinary Investigation Center.
E. A. Gibson.
Agriculture, Vol 74, 1967, p 183-188.

Descriptors: *Slurries, *Farm wastes, *Salmonella, Cattle, Hogs, Infection, Incubation, Diseases, Gases, Hydrogen sulfide, Ammonia, Carriers, Waste water treatment, Waste disposal.
Identifiers: *Disease hazard, Anthrax, England, Johnes disease, Avian tuberculosis, Salmonella dublin, Salmonella typhimurium.

The possibility of spreading infection by the use of slurry manure disposal techniques is discussed. It is well known that many infections of farm live-stock are spread in their excreta. Little is known about the effects of such spread as slurry on the land, but under certain circumstances, the use of these systems could increase the disease hazard. Salmonella infection and Johnes disease are discussed in this respect, and anthrax and avian tuberculosis are mentioned more briefly. It is suggested that effluents thought to contain salmonella should not be put on the pasture or fodder crops that will be used for cattle or sheep within six months. The same precaution applies to Johnes disease, except that for cattle up to six months old, the period should be extended to twelve months. These figures may need to be revised as further knowledge and experience is gained. The non-infectious hazards to animal health include the liberation of toxic gases when slurry is agitated or emptied. (White-Iowa State)
W71-05414

DIGESTION TESTS OF LIVESTOCK WASTES,
California Univ., Davis. Dept. of Agricultural Engineering.
Samuel A. Hart.
Journal of the Water Pollution Control Federation, Vol 35, No 6, June 1963, p 748-757. 7 fig, 2 tab, 11 ref.

Descriptors: *Farm wastes, *Poultry, *Cattle, *Sludge digestion, Stabilization, Hydrogen ion concentration, Alalinity, Biochemical oxygen demand, Chemical oxygen demand, Nitrogen, Carbon, Organic matter, Sewage, Odor, Gases, Waste water treatment.
Identifiers: *Dairy cattle, Volatile acids, Digesters, Gas production.

A laboratory test on the digestion of chicken and dairy manures indicates the following: (1) Both chicken and dairy manure would be stabilized satisfactorily in high-rate digesters equipped with adequate sludge-mixing equipment. (2) Dairy manure, because of its high lignin content, will effect organic matter destruction of only 10-15 percent. (3) The destruction of volatile matter expected from digesting chicken manure closely ap-

proximates that of municipal sludge digestion. (4) Operational parameters of pH, alkalinity, volatile acids, and the effect of temperature follow those expected for municipal sludge digestion. (5)Although nitrogen levels of chicken manure are high, digestion does not cause loss of nitrogen, but rather, through destruction of organic matter, it is concentrated to 8 or 9 per cent in the digested sludge. (6) BOD and COD are best expressed in terms of O2/mg VS for the high solids content of manures and manure sludges. (7) COD on a mg O2/mg VS basis increases upon digestion since digestion is a reducing reaction. (8) In total, digestion appears to have merit for stabilizing chicken manure. Consideration would still have to be given to final disposition since digestion does not destroy the waste. (White-Iowa State)
W71-05416

FLUSHING AWAY MANURE PROBLEMS,
Hog Farm Management, Minneapolis, Minn.
Cliff Johnson.
Hog Farm Management, Vol 8, No 1, p 23-25 and 68, January 1971. 7 fig.

Descriptors: *Recirculated water, *Disposal, Farm wastes, Reclaimed water, Lagoons, Hogs, Odor, Labor, Waste water treatment.
Identifiers: *Flushing gutters, Oxidation ditches, Siphon mechanism, Swine, Collection, Automatic dosing siphon.

The flushing gutter system being experimented with at Iowa State University is described. Two variations of the flushing technique, one utilizing a solenoid flushing mechanism and the other a siphon mechanism, have been studied. In the first case, water fills an overhead tank which trips the solenoid causing a plug to lift and thus discharging the tank's contents. For the siphon system, a tank is fitted with 2 1/2 in. N-shaped trap pipe underneath. As the tank fills with water, enough water pressure is built up to force the tank's contents down the pipe into the gutter. The water is discharged rapidly (150 gal. in 62 sec.) through the 2 1/2 in. pipe. Because of the water's force as it is flushed, no dung is left in the gutter after flushing. The gutter is flushed three times per day. Advantages of the system include (1) reduced ventilation requirements, (2) less odor, (3) better feed efficiency, (4) no gas problem, and (5) no labor involved in manure removal. (Christenbury-Iowa State)
W71-05417

FERTILIZATION OF ANNUAL RANGELAND WITH CHICKEN MANURE,
California Univ., Riverside. Dept. of Agronomy.
Cyrus M. McKell, Victor W. Brown, Robert H. Adolph, and Cameron Duncan.
Journal of Range Management, Vol 23, p 336-340, 1970. 2 fig, 6 tab, 4 ref.

Descriptors: *Poultry, *Grasslands, *Farm wastes, Fertilizers, Costs, Range management, Cost-benefit analysis, Crop response, Phosphorus, California, Proteins, Waste water treatment.
Identifiers: *Chicken manure, Palatability, Rangeland fertilizer.

Where annual rangelands are close to the source of supply, fertilization with chicken manure appears to hold considerable promise in improving the production of forage for grazing. Fertilized polts were ready to be used earlier in forage of a higher quality and palatability. Protein and phosphorus were significantly higher in forage from fertilized plots. Fertilizer value of chicken manure is equal to equivalent rates of commercial fertilizer. There appears to be a slower release of fertilizer elements from chicken manure than from inorganic fertilizer. Annual forage legumes do not appear to benefit initially from the application of chicken manure. In subsequent years following fertilization, the legumes appear to thrive on the increased level of available phosphorus. It was profitable for rangeland operators to fertilize with poultry manure provided they could get it for $3.10 to $4.35 per ton applied. An average of 1,600 pounds of extra feed was obtained for each ton of manure. (Christenbury-Iowa State)
W71-05419

ANIMAL WASTES - A NATIONAL PROBLEM,
Cornell Univ., Ithaca. Dept. of Agriculture; and Cornell Univ., Ithaca. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-05420

AGRICULTURE AND THE PREVENTION OF RIVER POLLUTION, AS EXPERIENCED IN THE WEST OF SCOTLAND,
Clyde River Purification Board (Scotland).
For primary bibliographic entry see Field 05B.
W71-05421

WHIPPING THE MANURE PROBLEM,
Alan Linn.
Farm Quarterly, Winter 1966-1967, p 56-59, 115-116. 4 fig, 2 tab.

Descriptors: *Farm wastes, *Hogs, *Oxidation, *Aerobic bacteria, Labor, Odor, Fertilizer, Value, Organic matter, Carbon dioxide, Water, Nitrogen, Ammonia, Nitrites, Nitrates, Phosphorus, Potassium, Hydrogen sulfide, Methane, Anaerobic bacteria, Aeration, Design standards, Volume, depth, Foaming, Dispersion, Costs, Submergence, Biochemical oxygen demand, Oxygen, Temperature, Waste water treatment.
Identifiers: *Oxidation ditch, *Paddle wheels, Agitation, Circulation, Batch system, Continuous system, Paddle wheel diameter, Slatted floors.

The oxidation ditch is described as an important new breakthrough in manure handling. Advantages of the oxidation ditch include savings in labor, handling manure as a liquid, elemination of almost all odor, and the preservation and concentration of fertilizer nutrients. Basic design standards are given for the ditch and paddle wheel. If the ditch is managed on a continuous basis, 1 1/2 percent of the ditch volume can be added as manure daily. General management requirements and costs are included. The paddle wheel with a 1 1/2 to 3-hp motor costs about $600. The ditch walls can be incorporated into the building's foundation. Estimated power costs are about $1.00 per hog and $8.20 per 1000 pound dairy cow per year. Many changes in confined livestock production through use of the oxidation ditch are contemplated. (White-Iowa State)
W71-05422

EFFLUENT QUALITY FROM ANAEROBIC LAGOONS TREATING FEEDLOT WASTES,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
Raymond C. Loehr.
Journal Water Pollution Control Federation, Vol 39, No 3, March 1967, p 384-391. 6 tab, 12 ref.

Descriptors: *Farm wastes, *Cattle, *Lagoons, Kansas, Biochemical oxygen demand, Odor, Dusts, Groundwater, Surface waters, Water pollution, Volume, Value, Soil environment, Temperature, Biodegradation, Anaerobic conditions, Mixing, Depth, Stabilization, Organic matter, Color, Nitrogen, Ammonia, Coliforms, Alkalinity, Hydrogen ion concentration, Equilibrium, Waste water treatment.
Identifiers: *Feedlots, *Anaerobic lagoons, Population equivalent, Slug load, Lagoon operation, Biological system, Surface area/volume ratio, Loading parameters, Volatile solids, Detention times.

Even under ideal equilibrium conditions, the liquid effluent from anaerobic lagoons treating livestock and feedlot wastes could pollute a receiving body of water. The quality of the effluent is decreased during the startup operations. The effluent is high in oxygen-demanding material, solids, and nitrogen. Subsequent treatment units are advisable to remove the solids and most of the oxygen-demanding material. Seasonal temperature variations will alter the effluent quality. The settled solids that need to be removed periodically from the anaerobic lagoon undergo considerable degradation, stabilization, and concentration. They are less potent than the entering untreated solids. However, their quality is such that they should not enter receiving waters. Land disposal offers an acceptable method of disposal for these solids. Anaerobic lagoons are not the complete answer to avoiding the pollution of natural waters by livestock and feedlot wastes. When used in combination with subsequent units to treat the effluent from the lagoons, anaerobic lagoons may be useful component process for livestock and feedlot wastes that have a high solids content. (White-Iowa State)
W71-05423

DISPOSAL OF DAIRY MANURE,
Massachusetts Univ., Amherst. Dept. of Agricultural Engineering.
Curtis A. Johnson.
Transactions of the American Society of Agricultural Engineers, Vol 8, 1965, p 110-112. 3 fig, 11 ref.

Descriptors: *Farm wastes, *Cattle, *Septic tank, Poultry, Fertilizers, Economics, Aesthetics, Efficiencies, Dusts, Evaluation, Value, Lagoons, Water pollution, Odor, Pumps, Methane, Anaerobic digestion, Aeration, Effluent, Recirculated water, Irrigation, Aerobic treatment, Waste water treatment.
Identifiers: *Scraper, *Dairy cattle, Manure production, Effectiveness, Push-button operation, Potential, Fly production, Appearance, Noise, Aerobic pond, Decomposition, Population equivalents, Agitation.

Heated septic tanks, adapted to recirculation of effluent, hold promise for efficient fluid handling of manure and other dairy wastes with minimum labor costs and reasonable structural costs. Effluent from a three chambered, heated septic is pumped to manure gutters behind specially designed stalls. The effluent provides enough pressure to force a scraper the length of the gutter, thus pushing the accumulated manure to the septic tank. General design criteria are given. An evaluation scale is developed for qualitative evaluation of various manure handling systems. (White-Iowa State)
W71-05424

THIN SPREADING OF SLURRIED MANURES,
California Univ., Davis. Dept. of Agricultural Engineering.
Samuel A. Hart.
Transactions of the American Society of Agricultural Engineers, Vol 7, 1964, p 22-28. 9 fig, 3 tab, 21 ref.

Descriptors: *Farm wastes, *Slurry, *Drying, Cattle, Hogs, Poultry, Moisture content, Viscosity, Pumps, Bulk density, Volume, Nitrogen, Odor, Organic matter, Carbon dioxide, Waste water treatment.
Identifiers: *Spreading, *Thin spreading, *Fluidization, Liquefaction, Solids per cent, Fly breeding, Slump, Layers, Layer thickness, Surface area.

The purpose was to determine how thick a layer of manure could be spread, day after day, layer upon layer, and still prevent fly breeding or other sanitation problems. Chicken and dairy manure was fluidized to 10 to 20 percent solids, and then spread in layers on two sets of six plots. The six plots in each series were dosed with increasing thicknesses of manure: from 1/25 to 1/4 inch for the chicken plots; 1/20 to 3/10 inch for the dairy plots. A specific plot received the same dose at each of the 47 applications. At a solids content of 85 percent, fly breeding was prevented. A significant amount of organic matter is lost during drying and storage, the loss being related to the moisture content of the

plot. One-half of the nitrogen originally present in the manure is also lost. The land area needed for cumulative layering is not large - less than 200 sq. ft. per cow and 1 sq. ft. per chicken. Odors can and do occur in manure thin spreading, but can be minimized by layering of fresh manure only. (White-Iowa State)
W71-05425

HOW WE HANDLE LIQUID MANURE,

Hoard's Dairyman, Vol 109, November 25, 1965, p 1254-1255, 1280-1281. 14 fig, 1 tab.

Descriptors: *Farm waste, *Cattle, *Storage tanks, Slurry, Costs, Volume, Age, Construction, Moisture content, Odor, Pumps, Electric power, Impellers, Nutrients, Waste water treatment.
Identifiers: *Dairy cattle, *Liquid manure system, Free stall housing, Agitation, Tank spreader, Fly breeding.

Five top dairymen are interviewed about their liquid manure handling systems. All incorporated storage tanks, and disposal on land with tank spreaders. Different types of agitation and pumping methods are explained. The systems ranged in cost from $3250 to $7800, or from $35 to $52 per cow. This included storage tank, agitation and pumping equipment, and tank spreaders. Several spent up to $6600 for concreting the barnyards. The tanks varied in capacity from 18,000 to 75,000 gallons, and were emptied as often as once a week to once every two months. The need for added moisture is discussed as well as fly and odor problems. Some disadvantages are given, the major one being the high capital investment. (White-Iowa State)
W71-05426

AEROBIC DIGESTION (COMPOSTING) OF POULTRY MANURE,
A. Livshutz.
World's Poultry Science Journal, Vol 20, 1964, p 212-215. 1 fig.

Descriptors: *Farm wastes, *Poultry, *Aerobic treatment, Aeration, Plastics, Plastic pipes, Width, Depth, Length, Volume, Pressure, Moisture, Temperature, Aerobic bacteria, Oxygen, Odor, Hydrogen ion concentration, Moisture content, Compaction, Waste water treatment.
Identifiers: *Composting, *Windrow method, Plastic sheets, Pressure blower, Forced-air system, Decomposition, Fly breeding, Carbon-nitrogen ratio, Oxidizing atmosphere.

The article describes a windrow method of composting in which a pressure blower forces air through lateral 3/4 inch diameter pipes. The pipes have four rows of about 15 holes, each one to two mm. diameter. The windrow, up to 50 meters long and 3 meters wide, is covered with a plastic sheet. Nine advantages of the aeration system are given. The plastic covering may eliminate turning of windrows, by preventing the upper layers of the composting material from drying out. The carbon-nitrogen ratio should be around 25-30:1 with a pH of about 7. Optimum moisture should be about 50 per cent. After about two weeks of composting, depending on the material and climatic conditions, the manure is sterilized, odorless and dry and can be used profitably for agircultural purposes. (White-Iowa State)
W71-05427

WASTES FROM PIG PRODUCTION UNITS,
Tay River Purification Board (Scotland); and North of Scotland Coll. of Agriculture, Aberdeen. Scottish Farm Buildings Investigation Unit.
R. A. Pontin, and S. H. Baxter.
Water Pollution Control, Vol 67, No 6, 1968, p 632-638. 4 tab, 4 fig, 11 ref.

Descriptors: *Farm wastes, *Hogs, *Activated sludge, Foaming, Freezing, Rotors, Effluent, Biochemical oxygen demand, Odor, Construction, Rubber, Linings, Recirculated water, Operations, Slurries, Sludge, Dissolved oxygen, Costs, Aeration, Water pollution, Public health, Lagoons, Anaerobic digestion, Filtration, Waste water treatment.
Identifiers: *Oxidation ditch, Slatted floor, Primary ditch, Secondary ditch, Suspended solids, Layout, Rubber sheeting, Continuous operation, Intermittent operation, Land disposal, Composting, Extended aeration.

Methods for the disposal or treatment of the increasing quantities of slurry from intensive pig production units are outlined. The possible application of the oxidation ditch for such treatment is discussed and the results of experiments of a commercial piggery are described. The authors conclude that the method offers the promise of an economic solution but that further research is urgently needed. (White-Iowa State)
W71-05428

LAGOONS FOR LIVESTOCK MANURE,
California Univ., Davis.
Samuel A. Hart, and Marvin E. Turner.
Journal Water Pollution Control Federation, Vol 37, No 11, November 1965, p 1578-1596. 5 tab, 6 fig, 9 ref.

Descriptors: *Farm wastes, *Poultry, *Cattle, *Hogs, *Lagoons, Stabilization, Biochemical oxygen demand, Anaerobic conditions, Sewage, Aerobic conditions, Odors, Volume, Sludge, Nitrogen, Phosphorus, Potassium, Chemical oxygen demand, Ammonia, Physical characteristics, Chemical characteristics, Hydrogen ion concentration, Alkalinity, Scum, Color, Opacity, Earth-water interfaces, Infiltration, Anaerobic digestion, Waste water treatment.
Identifiers: *Loading rates, *Physical appearance, Surface area, Total solids, Volatile solids, Volatile acids, Fly activity, Crusting, Pilot lagoons, Materials balance, BOD reduction, Sludge seed.

The need for more closely controlled tests of a laboratory type concerning livestock manure lagoons prompted this study. Eight concrete ringed pilot lagoons four feet in diameter and seven feet were used in the experiment. The units were fed poultry, dairy and cattle manure during the two year test. Chemical and physical properties were monitored weekly and are presented in tabular form. Infiltration from the packed earth bottom was considerable. This hampered the accurate determinations needed for a materials balance. Appearance, odors, and fly activity were noted. A section tells how to use the knowledge gained from the experiment. It is felt that with proper construction, property loading rates, and proper operation, lagoons can be expected to be satisfactory. (White-Iowa State)
W71-05429

TREATMENT OF LIVESTOCK WASTE -- A LABORATORY STUDY,
Missouri Univ., Columbia. Dept. of Sanitary Engineering; and Missouri Univ., Columbia. Dept. of Agricultural Engineering.
E. A. Jeffrey, W. C. Blackman, and Ralph Ricketts.
Transactions of the American Society of Agricultural Engineers, Vol 8, No 1, 1965, p 113-117, 126. 6 fig, 5 tab, 17 ref.

Descriptors: *Farm wastes, *Lagoons, *Anaerobic digestion, *Hogs, Aerobic treatment, Lagoons, Cattle, Sheep, Aeration, Sludge, Domestic wastes, Hydrogen ion concentration, Digestion tanks, Biochemical oxygen demand, Chemical oxygen demand, Waste dilution, Nitrification, Manometers, Design standards, Design criteria, Waste water treatment.
Identifiers: *Aerobic lagoon, Agitation, Volatile solids, Total solids, Beuch scale aerators, BOD/COD ratio, Detention time.

A study was made of the aerobic and anaerobic digestion characteristics of livestock wastes. The results obtained in the hog waste digestion studies are compared to design criteria for domestic sludge digestion units. Design loading conditions and water requirements are calculated for using an anaerobic lagoon for treating hog wastes. Design requirements for an aerobic lagoon are also indicated. It is concluded that disposal of hog wastes by use of aerobic lagoons is prohibitive because of the large requirements of both water and land area. The use of anaerobic lagoons is feasible, but it is accompanied by the problem of eventually having to dispose of the accumulated digested sludge. Future studies should be made on the operation of series lagoons. By using the first lagoon for settling and as an anaerobic lagoon, the area requirement of the second to serve as an aerobic lagoon would be greatly reduced, perhaps to the point of practicality. (White-Iowa State)
W71-05430

MECHANICAL CLEANING OF COWSHEDS,
Agricultural Land Service, Leeds (England).
J. N. Addison.
Agriculture, Vol 77, No 11, November 1970, p 534-536.

Descriptors: *Farm wastes, Cattle, On-site data collection, Age, Costs, Specifications, Depth, Width, Length, Slopes, Ponding, Maintenance, Waste water treatment.
Identifiers: *Dairy cattle, *Mechanical cleaners, *England, Continuous type, Shuttle type, Cow sheds, Blades.

Twenty-one cowsheds on eighteen farms were surveyed to establish the extent to which mechanical channel cleaners had been installed, their age, condition, costs, and reasons for their installation in the first place. Problems with the mechanical cleaners are discussed as well as design specifications. The cost per cow of the shuttle type cleaner was found to be about 21 pounds and that of the continuous type 18 pounds. (White-Iowa State)
W71-05431

TREATMENT OF FARM EFFLUENTS,
Water Pollution Research Lab., Stevenage (England).
A. B. Wheatland, and B. J. Borne.
Chemistry and Industry, February 29, 1964, p 357-362. 5 tab, 7 ref.

Descriptors: *Farm wastes, *Cattle, *Hogs, *Waste water treatment, Surface runoff, Volume, Water pollution, Biochemical oxygen demand, Cooling water, Carbon, Nitrogen, Nitrate, Effluents, Sewage, Filtration, Irrigation, Farm ponds, Silage, Organic matter, Biological treatment, Septic tanks.
Identifiers: *England, *Dairy cattle, Pollutional strength, Milking parlors, Permanganate, Recirculation, Land disposal, Soakaways, Chemical treatment.

Sources, volumes, and strength characteristics of farm effluents are discussed. A major portion deals with dairy and waste water effluents, coming from milking parlors and holding pens. Chemical and physical properties are listed in tabular form. Hog wastes and silage liquor are mentioned briefly as effluent sources. Treatment methods discussed include disposal on land, discharge to a sewer, biological treatment, septic tanks and chemical treatment. Disposal on land may be accomplished by use of tankers, soakaways, or irrigation. The use of storage ponds facilitates the latter. (White-Iowa State)
W71-05432

FUMIGATION AND REUSE OF BROILER LITTER,
Hawaii Univ., Honolulu. Dept. of Animal Sciences.
Ernest Ross.
Poultry Science, Vol 47, 1968, p 1711-1712.

Descriptors: *Farm wastes, *Poultry, *Fumigants, Broods, Performance, Mortality, *Waste treatment.

Identifiers: Weight gains, Feed conversion, Reused litter, Litter, Methyl bromide.

A series of experiments was conducted to compare the performance of broiler chicks reared on fresh and reused wood shavings litter. In addition, the effect of methyl bromide fumigation of reused litter on subsequent chick growth, feed conversion and mortality was studied. Non-fumigated fresh and reused litters served as controls. Methyl bromide fumigation reduced the total bacterial population of reused litter. This reduction, however, did not result in any significant improvement in body weight gains, feed conversion or mortality. The performance of the chicks reared on the fumigated litter was similar to that of chicks reared on reused litter and slightly superior to that of chicks reared on fresh wood shavings litter. The mortality o f chicks reared on fresh litter was slightly lower than in the groups on the reused litters. (White-Iowa State)
W71-05434

CONFINED SWINE MANURE DISPOSAL,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
Robert A. Bella.
Master of Science Thesis, 1968. 157 p, 37 fig, 47 ref. OWRR Project A-011-KAN (2).

Descriptors: *Farm wastes, *Pigs, Aerobic conditions, Oxygen requirements, Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Waste disposal.
Identifiers: *Swine wastes, *Oxidation ditch, Rotor capacity.

The object was the evaluation of an oxidation ditch for the treatment of swine manure. The oxidation ditch was constructed as part of the foundation for each building. Slotted floors permitted the manure to discharge directly from the animal into the treatment unit. Data were collected at weekly intervals from September, 1966 to August, 1967. The data indicated that the oxidation ditch could treat swine manure without odor nuisances. These units were able to reduce the soluble BOD to less than 10 milligrams per liter with a total effluent BOD of about 1,200 milligrams per liter. The effluent also contained considerable salts in addition to the suspended solids. It was necessary that the treated effluent be discharged into cultivated fields rather than being discharged into the adjacent drainage ditch. A holding pond was used to store the discharge of the treated effluent prior to spreading on nearby fields. (Miner-Iowa State)
W71-05435

AGRICULTURAL PRACTICES AND WATER QUALITY.
For primary bibliographic entry see Field 05B.
W71-05437

LIVESTOCK OPERATIONS AND FIELD-SPREAD MANURE AS SOURCES OF POLLUTANTS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W71-05438

MANURE DECOMPOSITION AND FATE OF BREAKDOWN PRODUCTS IN SOIL,
Department of Agriculture, Lincoln, Neb.; and Iowa State Univ., Ames.
For primary bibliographic entry see Field 05B.
W71-05439

MANURE TRANSFORMATIONS AND FATE OF DECOMPOSITION PRODUCTS IN WATER,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-05440

ANIMAL WASTE MANAGEMENT TO MINIMIZE POLLUTION,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W71-05442

ION EXCHANGE OF WASTE WATER FROM THE FOODSTUFF INDUSTRY,
Royal Danish School of Pharmacy, Copenhagen. Chemical Lab. A.
Sv. E. Jorgensen.
Vatten, Vol 4, p 350-357, 1970. 6 tab, 2 fig, 11 ref.

Descriptors: *Waste water treatment, *Precipitation, *Ion exchange, *Organic matter, Proteins, Phosphates, Nitrates, Carbohydrates.
Identifiers: *Polypeptides, *A-amino groups, *Foodstuff industry waste treatment.

A purification process for waste water from foodstuff industries by precipitation with glucose trisulphate and three ion exchangers was analyzed and is described. Proteins with high molecular weight were removed and the number of free a-amino groups are reduced by precipitation. The first ion exchanger also removes proteins but the substantial reduction of the number of a-amino groups is done by a cationic exchanger. This ion exchanger removes polypeptides of lower molecular weight and ammonia. A chelated anionic exchanger then removes low molecular polypeptides, phosphates, nitrates and carbohydrates. Eperimental conditions, and analytical methods for the ion exchange processes and elution are described in detail. (Ensign-PAI)
W71-05509

FUNGI ASSOCIATED WITH THE ACTIVATED-SLUDGE PROCESS OF SEWAGE TREATMENT AT THE LEBANON, OHIO, SEWAGE-TREATMENT PLANT,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Research Lab.
William Bridge Cooke.
The Ohio Journal of Science, Vol 70, No 3, p 129-146, May 1970. 2 fig, 8 tab, 11 ref.

Descriptors: *Pseudomonas, *Yeasts, *Activated sludge, *Sewage treatment, Ohio, Cultures, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Carbon, Suspended load.
Identifiers: Total organic carbon.

Samples of materials in various stages of sewage treatment were obtained at monthly intervals between October, 1967, and April, 1968, from the Lebanon, Ohio, sewage-treatment plant. A total of 93 species or species groups of fungi, including filamentous and yeast-like types, was recovered from both secondary and tertiary processes. Sampling and isolation techniques and data for several chemical and physical measurements made on the samples are presented. Effluent from the activated sludge aerator contained a ratio of 41 bacteria to one fungus, in contrast to a ratio of 1430 bacterial cells to one fungus cell in raw sewage. (Little-Battelle)
W71-05624

NTA,
Children's Cancer Research Foundation, Inc., Boston. Lab. of Environmental Toxicology; and Children's Cancer Research Foundation, Inc., Boston. Lab. of Carcinogensis.
For primary bibliographic entry see Field 05C.
W71-05639

GEOMETRIC PROGRAMMING AND THE PRELIMINARY DESIGN OF INDUSTRIAL WASTE TREATMENT PLANTS,
Rensselear Polytechnic Inst., Troy, N.Y. Dept. of Mathematics; and Union Coll., Schenectady, N.Y. Dept. of Economics.
J. G. Ecker, and J. R. McNamara.
Water Resources Research, Vol 7, No 1, p 18-22, February 1971. 5 p, 3 tab, 5 ref. NSF grant GI 15031.

Descriptors: *Optimization, *Dynamic programming, *Industrial wastes, *Waste treatment, *Design, Water quality, Cost, Stream improvement.
Identifiers: *Geometric programming.

The use of a new optimization theory termed 'geometric programming' was compared to the use of dynamic programming for preliminary design of industrial waste treatment plants. In a recent paper Shih and Krishnan used a dynamic programming approach to designing a waste treatment plant operating on pulp and paper manufacturing wastes that provided a required effluent quality in terms of percent of 5-day (first stage) biochemical oxygen demand (BOD) removed at minumum total annual cost. This cost, assumed constant over time, was composed of construction amortization costs, insurance costs, and operation costs. Then the geometric programming was proposed which used Program A in association with program B forming a 'dual' program relationship where one program was studied through properties of the other. Since the optimal value of program A equaled the optimal values, of B, finding a minimizing vector for program A relied on solving program B first. For the design problem under consideration, the dual program B was solved by associating it with various designs. Detailed calculation for design 1, a combination of four processes in series: primary clarification, trickling filter, activated sludge with secondary clarification, and carbon adsorption, illustrated the procedure. It was shown that geometric programming plays an important role in large stream quality problems. (Kriss-Cornell)
W71-05680

DISPOSAL OF WASTES FROM SWINE FEEDING FLOORS TO MINIMIZE STREAM POLLUTION,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
W. F. Schwiesow, H. L. Brodie, and H. J. Eby.
Available from NTIS as PB-198 028, $3.00 in paper copy, $0.95 in microfiche. Completion Report, University of Maryland, Water Resources Research Center, January 1970. 11 p. OWRR Project A-004-MD (1).

Descriptors: *Farm wastes, *Water pollution sources, *Pigs, *Septic tanks, Digestion tanks, Sedimentation tanks, Soil disposal fields, *Waste disposal, Waste water treatment.
Identifiers: *Flushing gutters, Swine manure.

This research was to investigate the feasibility of a septic disposal system with an underground distribution system as a means of eliminating runoff from swine feeding floors into the surface waters. Installation provided for hydraulic cleaning of the feeding floor. Manure, water and uneaten feed was washed into gutters, one on each side of the house. Modifications included the addition of a 7,000 gallon tank, a 1,200 gallon tank and connecting 4 inch PVC pipe. Six hundred feet of perforated plastic drain lines were located near the tanks. It was soon evident that the large tank intended to serve as a septic tank was inadequate and performed primarily as a sedimentation tank. Data taken showed this tank was satisfactory for accumulating solid wastes for a period of about 5 weeks. Solids were removed by mechanical means. Tests on the tile distribution system showed that the capacity to dispose of the liquid effluent was more than needed. Proper operation should provide a satisfactory means of disposing of the liquid portion of the wastes without polluting the nearby river. (Miner-Iowa State)
W71-05738

A REPORT ON THREE MANURE COMPOSTING PLANTS,
Public Health Service, San Francisco, Calif.
John S. Wiley.

Compost Science, Vol 5, Summer 1964, p 15-16. 3 fig.

Descriptors: *Farm wastes, Public health, Cattle, Poultry, Organic wastes, Aerobic conditions, Anaerobic conditions, Mositure content, Aeration, Odor, Pathogenic bacteria, Screens, Nitrogen, Ammonia.
Identifiers: *Composting, *Aerobic decomposition, Nuisance, Fly production, Windrow composting, Rotary drum composter, Soil conditioner.

The article describes three manure composting plants which process manure in a sanitary, economical manner and use the product as a soil conditioner. One plant treats a mixture of feedlot manure from 5500 steers and meat packing wastes in long windrows which are turned six times during the six week composting period. The other two plants treat poultry manure in rotary drum composters. Each of these two plants treats wastes from one million birds. The compost is sold as a humus plant food. The three plants are interesting attempts to process manures in a sanitary manner and to utilize the resulting product for the benefit of the soil. (White-Iowa State)
W71-05739

EFFECTS OF ORGANIC MANURES ON SOILS AND CROPS,
Reading Univ. (England). Dept. of Agricultural Botany.
A. H. Bunting.
Proceedings Nutrition Society, Vol 24, No 1, p 29-38, 1965. 4 tab, 14 ref.

Descriptors: *Soils, *Crops, *Organic matter, Fertilizers, Farm wastes, Nitrogen, Phosphorus, Potassium, Crop production, Nutrients, Wheat, Potatoes, Sewage sludge, Calcium, Fertility, Temperature, Moisture content, Soil structure.
Identifiers: *Farmyard manure, *Organic manures, Mineral fertilizers, Sludge compost, Minor elements.

The paper reports on the effects organic manure, and especially farmyard manure, has on different soils and crops. The effects of organic manures on crops are often important, but they are largely associated with changes in the supply of nutrients. However, there is good evidence that on some special soils, they have special effects on crop growth. The paper then focuses on changes which take place in the soil as a result of organic matter addition. Moisture content and soil structure are most particularly affected. (White-Iowa State)
W71-05740

EVALUATION OF SEVERAL METHODS OF ISOLATING SALMONELLA FROM POULTRY LITTER AND ANIMAL FEEDSTUFFS,
Massachusetts Univ. Amherst. Dept. of Veterinary and Animal Sciences.
C. F. Smyser, and G. H. Snoeyenbos.
Avian Diseases, Vol 13, No 1, p 134-141, 1969. 5 tab, 13 ref.

Descriptors: *Salmonella, *Poultry, Bacteria, Farm wastes, Microorganisms, By-products, Incubation, Sampling, Frequency.
Identifiers: *Poultry litter, *Feedstuffs, Enrichment broths, Selenite broth, Animal by-products, Feed mills, Rendering plants, Tetrathionate broth, Significant difference, Proteus.

A comparison of several different culture procedures for Salmonella isolations, using selenite-brilliant green-sulfapyridine (SBG sulfa) and tetrathionate brilliant green (TBG) as enrichments was made with 198 litter samples of which 161 were positive by one or more methods, and with 371 animal feedstuff samples of which 111 were positive by one or more methods. All enrichments were streak-plated after 48 hour incubation. SBG sulfa incubated at 43C was superior to SBG sulfa at 37C, and to TBG at 37C with or without pre-enrichment for the isolation of salmonellae from poultry litter and animal feedstuffs. Significantly more samples of animal feedstuffs yielded salmonellae from SBT sulfa at 43C than from the other two media. More salmonella colonies and fewer competing organisms were usually obtained on BG agar plated from SBG sulfa at 43C than from either SBG sulfa at 37C or TBG. SBG sulfa appeared to be a more favorable enrichment medium than TBG for isolating S. senftenberg; differences in the number of isolations among several other serotypes were too small for comparison. (White-Iowa State)
W71-05741

CHEMICAL AND BIOLOGICAL REACTIONS FROM LAGOONS USED FOR CATTLE,
Wisconsin Univ., Madison.
S. A. Witzel, Elizabeth McCoy, and Richard Lehner.
ASAE Paper No 64-417. Transactions of the American Society of Agricultural Engineers, Vol 8, p 449-451, 1965. 1 fig, 16 ref.

Descriptors: *Oxidation lagoons, *Biochemical oxygen demand, *Anaerobics, Algae, Bacteria, Water pollution sources, Odor, Farm waste, Sludge, Solid wastes, Decomposting organic matter, Lagoons, Cattle.
Identifiers: Organic nitrogen, Bacteriological study, Aerobicity.

An experimental lagoon to receive the wastes as liquid manure from six bulls was constructed. In an experimental barn the manure from the bulls was washed daily into two gutters 24 in. wide at the top. The gutters had a capacity of 2000 gallons. The gutters were flushed every seven days into a lagoon. The circular lagoon had a 60 ft diameter at the top, a 40 ft diameter at the bottom and was 5 ft deep. Liquid manure samples were taken from the barn gutter and from the lagoon manure liquid and sludge. BOD tests were conducted on all samples and the percent BOD reduction from gutter to lagoon was calculated. Other tests were made to determine percent total solids removal, organic nitrogen content, pH values, and temperature. Extensive tests were made and reported on bacteria content, both quantitative and qualitative. Five conclusions of the study are mentioned. (Parker-Iowa State)
W71-05742

ARTHROPOD PREDATORS OF IMMATURE DIPTERA DEVELOPING IN POULTRY DROPPINGS IN NORTHERN CALIFORNIA: PART I,
California Univ., Berkeley. Dept. of Entomology and Parasitology.
John H. Peck, and John R. Anderson.
Journal Medical Entomology, Vol 6, No 2, p 163-167, May 31, 1969. 4 tab, 19 ref.

Descriptors: *Poultry, *Diptera, Farm wastes, Biocontrol, Sampling, California, Seasonal, Mosture content, Animals, Mites.
Identifiers: *Arthropod predators, Fly control, Filth flies, Cohabitation, Poultry droppings, Predatory fauna, Coleoptera, Enumeration.

Arthropod predators occurring in manure at 2 Sonoma County, California, poultry ranches were identified and studied. Seasonal abundance and association with prey were determined for the following major predators: Macrocheles muscaedomesticae, Glyptholaspis confusa, Fuscuropoda sp., Carcinops pumilio, Margarinotus merdarius, Philonthus politus, P. sordidus, Staphylinus maxillosus villosus, Muscina stabulans, and Ophyra leucostoma. (See also W71-05744). (White-Iowa State)
W71-05743

ARTHROPOD PREDATORS OF IMMATURE DIPTERA DEVELOPING IN POULTRY DROPPINGS IN NORTHERN CALIFORNIA: PART II,
California Univ., Berkeley. Dept. of Entomology and Parasitology.
John H. Peck.
Journal Medical Entomology, Vol 6, No 2, p 168-171, May 31, 1969. 4 tab, 15 ref.

Descriptors: *Poultry, *Diptera, California, Seasonal, Predation, Mites, Mortality, Insect eggs, Larvae, Light, Farm wastes.
Identifiers: *Arthropod predators, Predation potential, Media cohabitation, Pupae, House fly eggs, Variance, Poultry droppings.

The feeding responses of 3 species of predaceous Staphylinidae and 2 species of predaceous Histeridae were studied by exposing them to eggs, larvae and pupae of Musca domestica and Fannia femoralis. Studies of age-of-prey specific predation by M. muscaedomesticae on immature M. domestica showed that most mortality was inflicted on eggs and first instar larvae. Predation rates were determined for the above and 6 other predaceous species; the following indices of predation potential were computed for the 5 most abundant predators: Fuscuropoda sp. (adults) - 3.5, Glyptholaspis confusa females - 4.4, Macrocheles muscaedomesticae females - 95.8, Carcinops pumilio (adults) - 97.0, and Ophyra leucostoma L3 - S226.4. The potential importance of the above predators is discussed with reference to their seasonal and media cohabitation with various prey species. (See also W71-05743). (White-Iowa State)
W71-05744

TWO BILLION TONS OF - WHAT,
Department of Agriculture, Beltsville, Md. Livestock Engineering and Farm Structures Research Branch.
Harry J. Eby.
Compost Science, Vol 7, p 7-10, Autumn 1966. 2 fig.

Descriptors: *Farm wastes, *Volume, *Organic wastes, Domestic wastes, Cattle, Poultry, Nutrients, Value, Organic matter, Topsoil, Turf, Water pollution, Percolation, Fertilizers, Filters.
Identifiers: *Waste production, *Grass belts, *Composting, Population equivalent, Land disposal, Pollution control.

The author advocates managing our millions of tons of organic waste, both farm and municipal, in such a way that grass belts would be planted along the borders of streams and rivers. The organic wastes would be worked into these areas in large quantities to improve the quality of the soil. His proposal is based on three factors: (1) Soil with a high organic content holds more water than soils with little organic content. (2) Incorporating organic matter into a clay soil improves its percolation rate as well as its water-holding capacity. (3) Soil is a good bacterial filter. Thus the grass belts would act as a means of stream and river pollution control. The author feels that more research is needed to find components of manure which would have continuing industrial or commercial applications. Examples are given illustrating the magnitude of the animal waste disposal problem. (White-Iowa State)
W71-05745

FARM WASTES.

Proceedings of Symposium, Farm Wastes, The Institute of Water Pollution Control, The University of Newcastle upon Tyne, 1970. 148 p.

Descriptors: *Farm wastes, Disposal, Legislation, Slurries, Composting, Disease, Legal aspects, Hazards, Toxicity, Public health, Odors, Costs, Design criteria, Treatment, Adsorption, Reverse osmosis, Confinement pens, Hogs, Equipment, Microorganisms, Farm lagoons, Irrigation, Aeration, Aerobic treatment, Anaerobic treatment, Biochemical oxygen demand, Chemical oxygen demand, Biological treatment.

Identifiers: Health, Public nuisance, Population equivalents, Swine, Slatted floors, Oxidation ditch, Flushing gutter, Systems, Gas production, United Kingdom.

The two day symposium was attended by over 200 delegates including representatives from local authorities, river authorities, universities, agricultural colleges and research stations, nationalized industries and consultants. The various Ministries were well represented, with over 60 delegates. Those attending included delegates from Canada, Denmark, Eire, Holland and the United States. Nineteen technical papers were presented. A discussion of each paper is included. Four sessions were conducted: An introductory session, 4 papers; Problems off the farm, 3 papers; Minimizing the waste problem, 7 papers; and Waste treatment and disposal on the farm, 5 papers. (See also W71-05748 thru W71-05766). (Christenbury-Iowa State)
W71-05747

THE PROBLEM OF DISPOSAL OF FARM WASTES, WITH PARTICULAR REFERENCE TO MAINTAINING SOIL FERTILITY,
National Agricultural Advisory Service, Bristol (England). Soil Science Dept.
C. Berryman.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 3, p 19-23, 1970. 4 tab, 4 ref.

Descriptors: *Disposal, *Slurries, *Fertility, Farm wastes, Anaerobic conditions, Nutrients, Irrigation, Value, Fertilizers, Waste disposal.
Identifiers: *Animal slurry, *Composition, Organic irrigation.

This paper reviews the effect of farm waste, particularly in the form of animal slurry, on soil fertility. Slurry can supply an important part of the NPK requirements on the farm. The application of slurry to land is the most convenient and practical method of disposal, but problems due to a breakdown of soil structure can occur if an unsuitable soil receives excessive applications of slurry. The soil type is important when assessing the effect slurry disposal will have on the fertility of soil. (See also W71-05747). (Christenbury-Iowa State)
W71-05750

SEWERS AND SEWAGE TREATMENT,
Chartered Civil Engineers, London (England); Newcastle-upon-Tyne Univ. (England).
James R. Simpson, and R. L. Hibberd.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 7, p 44-51, 1970. 2 fig, 2 tab, 13 ref.

Descriptors: *Costs, *Design criteria, *Sewage treatment, Farm wastes, Biochemical oxygen demand, Legislation, Dissolved solids, Tertiary treatment, Sewers, Activated sludge, Capital cost.
Identifiers: River authority, Loading rates, Mogden formula, United Kingdom, Population equivalents, Suspended solids.

The purpose of this paper is to aquaint those unfamiliar with sewerage and sewage treatment with the general nature of the systems and processes. References to more detailed descriptions of the processes are included. Further, an attempt is made to answer the questions, 'Why and to what extent would a discharge with given characteristics affect the design of the sewers and the sewage-treatment works, and at what cost.' A formula for allocating waste treatment cost to agriculture is discussed. A discussion of the paper is included. (See also W71-05747). (Christenbury-Iowa State)
W71-05754

MINIMIZING THE WASTE DISPOSAL PROBLEM IN VEGETABLE PROCESSING,
Electricity Council Research Center, Capenhurst (England).
F. Barrett.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 8, p 57-65. 7 fig, 4 tab.

Descriptors: *Apparatus, *Adsorption, *Reverse osmosis, Farm wastes, Desalination, Chemical oxygen demand, Recirculated water, Aeration, Flotation, Chlorination, Ultraviolet radiation, Biochemical oxygen demand, Equipment, Ozone, Biological treatment, Sludge disposal, Treatment.
Identifiers: *Food processing, Sterilization, Ozonation, United Kingdom, Vegetable processing.

This paper discusses possible mentods of treating waste from vegetable processing plants. The results obtained from a coagulation/flocculation unit have been encouraging. An aeration tower complex has been utilized for biological treatment. A pilot-scale adsorption unit and a reverse osmosis unit have been designed, built, and evaluated. A discussion and the reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05755

MINIMIZING POULTRY WASTE PROBLEMS,
National Agricultural Advisory Service, London (England).
C. T. Riley.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 9, p 66-72. 3 fig, 5 tab, 1 ref.

Descriptors: *Farm wastes, *Poultry, *Disposal, Costs, Biochemical oxygen demand, Odor, Land use, Sludge, Chemical properties, Physical properties, Fertilizers.
Identifiers: Composition, Hatchery waste, Broilers, United Kingdom.

This paper is divided into two parts; first an assessment of the industry and second an approach to some current problems. Manure from cage layers represents the major disposal problem in the poultry industry today. The physical and chemical properties of waste is given. In the main, poultry waste has to be returned to the land in some form. The disposal of manure from laying batteries is discussed in relation to minimizing the poultry-waste problems. Whether to handle the manure as a solid or liquid is examined. A discussion and reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05756

MINIMIZING THE WASTE PROBLEM WITH PIGS,
National Agricultural Advisory Service, London (England).
C. G. Pointer.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 10, p 73-80. 7 fig.

Descriptors: *Confinement pens, *Design standards, *Hogs, Farm wastes, Slurries, Odor, Cleaning.
Identifiers: *Swine, Slatted-floor, Slurry systems, Sow feeders, Fattening house, Farrowing, United Kingdom, Manure handling, 'Ad-lib' feeding.

The first step towards minimizing the problems will be in the choice of site for the new pig unit. The larger the unit the more critical this decision will be. Subsequently the management and housing systems selected must be suited to the site. Systems have been described in this paper which minimize the problems. In existing problem units common sense and discretion can often avoid acute situations developing. It is hoped that economic solutions for these units will be evolved. In any event, there is always likely to be some smell from a piggery. A discussion and the reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05757

MINIMIZING THE WASTE PROBLEM WITH CATTLE,
Newcastle-upon-Tyne Univ. (England).
M. M. Cooper.
Proceedings of Symposium: Farm Wastes: The Institute of Water Polution Control and The University of Newcastle upon Tyne. 1970. Paper No 11, p 81-83.

Descriptors: *Farm wastes, *Slurries, *Disposal, Cattle, Costs, Confinement pens.
Identifiers: *Cubicle system, Cowtels, United Kingdom.

This paper discusses some of the changes taking place in the cattle industry and the requirements for waste disposal. Many cattle producers require confinement areas for cattle for at least part of the year. Some of the systems being utilized for waste disposal are discussed. A discussion and the reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05758

BUILDING DESIGN,
Chartered Architects, London (England).
J. B. Weller.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No. 12, p 84-93. 2 fig, 6 tab.

Descriptors: *Farm wastes, *Cost comparisons, *Disposal, Management, Slurries, Design criteria, Gases, Farm lagoons, Buildings, Storage tanks, Storage capacity, Livestock, Treatment.
Identifiers: United Kingdom, Slatted floors, Perforated floor, Cubical-house, Bacon house.

This paper discusses some design criteria for animal housing. The first portion of the paper deals with the management factors that must be considered, such as type of manure, quantity, disposal method, bedding, and cost. The remainder of this paper examines some of the implications regarding actual building types. There is a comprehensive table giving the definitions and requirements for the management of slurry and manure from livestock. A cost analysis of the various possible disposal systems is presented. A discussion and reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05759

BUILDING DESIGN AND MANURE DISPOSAL,
Institutt voor Landbouwbedrijfsgebouwen, Wageningen (Netherlands).
J. C. Glerum, A. P. S. De Jong, and H. R. Poelma.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 13, p 94-100. 3 fig, 3 tab.

Descriptors: *Farm wastes, *Disposal, *Costs comparison, Cattle, Storage tanks, Slurries, Storage capacity, Design criteria.
Identifiers: Mucking-out, Mixed storage, Separate storage, Animal housing, Cubicle house.

In general, slurry systems are preferable to systems for handling solids and urine separately. Special reasons, for example difficulty in disposing of the manure, can cause separate storage to be used. If mixed storage is used the layout of the buildings must be adapted to the specific requirements of this system. Altering the buildings afterwards will usually be very expensive. The high capital cost of the slurry system will often be a drawback; this is especially the case for cowhouses where a considerable storage capacity is required. A discussion and the reply to the discussion follows on page 106-109. (See also W71-05747) (Christenbury-Iowa State)
W71-05760

PIGGERY CLEANING USING RENOVATED WASTES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
R. J. Smith, T. E. Hazen, and J. R. Miner.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 14, p 101-105. 1 fig, 13 ref. Grant EC 00283.

Descriptors: *Disposal, *Equipment, *Oxidation lagoons, Farm wastes, Design criteria, Confinement pens, Management, Recirculated water, Anaerobic conditions, Slurries, Sludge, Microorganisms.
Identifiers: *Oxidation ditch, *Flushing gutter, Manure removal.

A full-scale study of the possibility of renovating swine manure for use in manure transport was carried out. Preliminary anaerobic treatment and settling took place in a lagoon followed by secondary treatment in an oxidation ditch. Measurements of COD, BOD, nitrogen, solids and certain inorganic salts were made during the period February to May 1969. Assessment of the results showed that the system had considerable promise from the standpoint of confinement house environmental improvement and labour reduction. A stable and sanitary effluent was obtained at all times which showed no adverse effects upon the performance of the animals exposed to it. Rainfall precluded useful information being obtained concerning salt build-up or toxicity in the treatment system. No toxicity effects were apparent after continuous operation for 20 weeks. The test was terminated because of mechanical failures. A discussion and the reply to the discussion follows the paper on page 106-109. (See W71-05747) (Christenbury-Iowa State)
W71-05761

LAND DISPOSAL AND STORAGE OF FARM WASTES. 1. PLANNING AND CHOICE OF SYSTEM,
National Agricultural Advisory Service, London (England). County Dairy Husbandry Adviser.
A. J. Quick.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 15, p 110-115. 1 tab, 6 ref.

Descriptors: *Farm wastes, *Disposal, *Effects, Slurries, Planning, Management, Dry farming, Storage, Equipment.
Identifiers: *Systems, *Comparison, Wash water, Wet farms.

This paper deals with the immediate problems facing the dairy farmer who finds himself in the economic squeeze, with the inevitable result that he will intensify his dairy enterprise. At the moment there is no universal solution to his problems, but they can be tackled, first by identifying the factors which will influence the choice of system (by factors are meant soil type, system of cow-housing, and unit size) and second, by selecting the most suitable system from the available alternatives. (See also W71-05763 and W71-05747) (Christenbury-Iowa State)
W71-05762

LAND DISPOSAL AND STORAGE OF FARM WASTES. 2. HANDLING AND DISTRIBUTION,
National Agricultural Advisory Service, London (England). National Livestock Mechanization Specialist.
J. I. Payne.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 16, p 116-121. 1 fig, 2 tab, 1 ref.

Descriptors: *Farm wastes, *Mechanical equipment, *Distribution, Slurries, Disposal, Treatment, Storage, Costs, Cattle, Irrigation.
Identifiers: *Handling, Removal, Solid manure, Organic irrigation.

The mechanization aspect of applying farm effluent to the land is governed by the physical state of the effluent, the stock housing system and the type of farm on which the stock enterprise is situated. Consequently three basic systems of handling manure onto the land have evolved. These are handling it as a solid manure, as a dense slurry, and as a diluted slurry. This paper discusses the equipment required for each of the handling systems. In general, if the manure can be kept solid the problems will be fewer. (See also W71-05762 and W71-05747) (Christenbury-Iowa State)
W71-05763

AEROBIC TREATMENT OF FARM WASTES,
North of Scotland Coll. of Agriculture, Aberdeen. Scottish Farm Buildings Investigation Unit.
K. Robinson, S. H. Baxter, and J. R. Saxon.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No. 17, p. 122-131. 1 tab, 9 fig, 26 ref.

Descriptors: *Aeration, *Mechanical equipment, *Aerobic treatment, Farm wastes, Odor, Slurries, Ventilation, Farm lagoons, Biochemical oxygen demand, Hogs, Chemical oxygen demand, Microorganisms, Dissolved oxygen, Laboratory tests, Waste water treatment.
Identifiers: Oxidation ditch, Aeration lagoon.

This paper is divided into two main sections - a review of existing commercially available methods of aerobic waste disposal and an outline of the project in Aberdeen for the study of pig-waste treatment. The review is limited to a description of aerobic methods and no specific attempt has been made to compare the relative merits of these systems, since a critical examination of some of them is one of the aims of our project. The characteristics of pig waste, its oxygen demands, and the influences of copper on bacterial activity are discussed. The factors influencing the growth and metabolic activity of micro-organisms are outlined and the problems of satisfactory methods of laboratory determinations are emphasized. (See also W71-05747) (Christenbury-Iowa State)
W71-05764

ANAEROBIC TREATMENT OF FARM WASTES,
West of Scotland Agricultural Coll., Glasgow. Dept. of Bacteriology.
Selwyn Baines.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No. 18, p 132-137. 1 tab, 20 ref.

Descriptors: *Farm wastes, *Anaerobic digestion, Anaerobic conditions, Anaerobic bacteria, Microorganisms, Sludge, Slurries, Mixing, Hydrogen ion concentration, Biochemical oxygen demand, Digestion, Design data, Methane, Waste water treatment.
Identifiers: Commercial applications, Gas production.

This paper describes the effects of anaerobic treatment and its application to farm wastes. A satisfactory methane fermentation can be established and maintained. The digested sludge is relatively inert, free from nuisance and more amendable to dewatering. The anaerobic digestion process also reduces the risk of pathogenic organisms causing human or animal diseases. The design and operation of an anaerobic treatment process is described. Several reports from commercial installations are included. (See also W71-05747) (Christenbury-Iowa State)
W71-05765

TREATMENT OF FARM WASTES,
Instituut voor Landbouwbedrijfsgebouwen, Wageningen (Netherlands).
H. M. J. Scheltinga, and H. R. Poelma.

Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne. 1970. Paper No 19, p 138-142. 3 tab, 3 fig.

Descriptors: *Farm wastes, *Biological treatment, *Aerobic treatment, Farm lagoon, Activated sludge, Aeration, Slurries, Biochemical oxygen demand, Sludge, Cost comparison, Waste water treatment.
Identifiers: Oxidation ditch, Pasveer ditch.

This paper is related to biological treatment of farm animal waste. Aerobic treatment is described. A schematic of an oxidation ditch and an aeration pit is included. The economic aspect of the oxidation ditch versus the aeration pit is presented. A discussion of the paper is included. (See also W71-05747) (Christenbury-Iowa State)
W71-05766

5E. Ultimate Disposal of Wastes

SLUDGE DUMPING IN THE THAMES ESTUARY,
Ministry of Agriculture, Fisheries and Foods, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W71-05342

STATE OF THE ART REVIEW ON SLUDGE INCINERATION PRACTICE,
Resource Engineers, Wilton, Conn.
For primary bibliographic entry see Field 05D.
W71-

EQUIPMENT FOR THE APPLICATION OF AGRICULTURAL EFFLUENTS,
National Agricultural Advisory Service, London (England).
For primary bibliographic entry see Field 05D.
W71-05413

DISPOSAL OF FARM EFFLUENT,
Ministry of Agriculture, Fisheries and Food, Norwich (England). Veterinary Investigation Center.
For primary bibliographic entry see Field 05D.
W71-05414

HARBOR DRIFT DISPOSAL,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-05514

THE FATE OF INTESTINAL BACTERIA IN THE SEA,
Harvard Univ., Cambridge. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 05B.
W71-05527

EFFECTS OF ORGANIC MANURES ON SOILS AND CROPS,
Reading Univ. (England). Dept. of Agricultural Botany.
For primary bibliographic entry see Field 05D.
W71-05740

FARM WASTES.
For primary bibliographic entry see Field 05D.
W71-05747

ORIGINS AND NATURE OF FARM WASTES,
National Agricultural Advisory Service, London (England).
For primary bibliographic entry see Field 05B.
W71-05748

THE PROBLEM OF DISPOSAL OF FARM WASTES, WITH PARTICULAR REFERENCE TO MAINTAINING SOIL FERTILITY,
National Agricultural Advisory Service, Bristol (England). Soil Science Dept.
For primary bibliographic entry see Field 05D.
W71-05750

BUILDING DESIGN AND MANURE DISPOSAL,
Institutt voor Landbouwbedrijfsgebouwen, Wageningen (Netherlands).
For primary bibliographic entry see Field 05D.
W71-05760

LAND DISPOSAL AND STORAGE OF FARM WASTES. 1. PLANNING AND CHOICE OF SYSTEM,
National Agricultural Advisory Service, London (England). County Dairy Husbandry Adviser.
For primary bibliographic entry see Field 05D.
W71-05762

LAND DISPOSAL AND STORAGE OF FARM WASTES. 2. HANDLING AND DISTRIBUTION,
National Agricultural Advisory Service, London (England). National Livestock Mechanization Specialist.
For primary bibliographic entry see Field 05D.
W71-05763

THE COASTAL POLLUTION PROBLEM IN CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W71-05802

ECONOMIC ASPECTS OF SOLID WASTE DISPOSAL AT SEA,
Massachusetts Inst. of Tech., Cambridge.
J. W. Devanney, III, V. Livanos, and J. Patell.
Sea Grant Project Office, Report No, MITSG 71-2, November 20, 1970. 124 p, 12 fig, 71 ref.

Descriptors: *Waste disposal, *Waste dumps, *Solid wastes, *Landfills, *Incineration, Economics, New York, Costs.
Identifiers: New York City.

A comparison of the market costs of different solid waste disposal alternatives is made. Through present value analysis, unit market disposal costs are derived for sanitary land fill by rail haul, land incineration, dumping of compacted bales at sea and sea incineration. The potential ecological problems of each system are considered. New York City is used as an example to provide a realistic picture of the potential and economic aspects of solid waste disposal at sea. (Ensign-PAI)
W71-05808

5F. Water Treatment and Quality Alteration

EXPERIMENTAL INVESTIGATION OF THE PRODUCTION OF BACTERIA IN WATER AND CONSUMPTION OF BACTERIA BY DAPHNIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennikh Vod.
V. I. Romanenko.
Mikrobiologia, Vol 39, No 4, p 711-715, 1970. 4 tab, 7 ref.

Descriptors: *Bacteria, *Daphnia, *Absorption, Biomass, Water purification, Analysis, Radioactivity techniques.
Identifiers: Antibiotics, Penicillin, Aureomycin.

Consumption of bacteria by daphnia in water basins was determined following suppression of bacterial multiplication by an addition of penicillin or aureomycin. Control cultures provided information on the increment of bacteria in the absence of daphnia. The palatability of antibiotic-treated bacteria was verified through introduction of carbon-14 labeled bacteria and measurement of radioactivity of daphnia. The results coincided with formulae of Romanov and Zonov and that of Huck. The method possesses a greater reliability than the filtration analyses. (Wilde-Wisconsin)
W71-05397

SALMONELLOSIS IN CATTLE,
Ministry of Agriculture, Fisheries and Food, Norwich (England). Veterinary Investigation Center.
E. A. Gibson.
Agriculture, Vol 73, 1966, p 213-216.

Descriptors: *Farm wastes, *Cattle, *Salmonella, Pathogenic bacteria, Infection, Bacteria, Carriers, Disinfection, Water treatment.
Identifiers: *Salmonella dublin, *Salmonella tyhimurium, Calves, Illness, England, Clinical signs, Vaccine, Prevention, Outbreaks.

The article describes the diagnosis, treatment, clinical signs, and prevention of salmonella in cattle. Though usually a disease causing calf losses it can affect adult cattle too. Under British conditions two main organisms are responsible. These are S. dublin which is essentially a pathogen of cattle, and S. typhimurium which seems able to infect all species of birds, animals, and man with equal facility. Recommendations are made for the disinfection and prevention of the disease. (White-Iowa State)
W71-05433

DISEASE TRANSMISSION OF WATER-BORNE ORGANISMS OF ANIMAL ORIGIN,
Minnesota Univ., St. Paul. Dept. of Veterinary Microbiology and Public Health.
For primary bibliographic entry see Field 05B.
W71-05441

COLORIMETRIC METHODS FOR BROMINE,
Illinois State Water Survey, Champaign. Chemistry Section.
Frank W. Sollo, Thurston E. Larson, and Florence F. McGurk.
Environmental Science and Technology, Vol 5, No 3, p 240-246, March 1971. 7 p, 9 fig, 7 ref. U.S. Army Medical Research and Development Command. Contract DA-49-193-MD-2909.

Descriptors: *Water treatment, *Disinfection, *Colorimetry, *Water analysis, Chemical analysis, Color, Water chemistry.
Identifiers: *Bromine analysis, *Bromamines.

Reportedly bromamines are far more effective disinfectants than the chloramines and approach free bromine in disinfecting power. Study was undertaken to develop suitable colorimetric methods for determining free bromine and bromamines in water. Numerous reagents were screened on the basis of their reaction with HOCl, HOBr, NH2Cl, and NH2Br. Five reagents (methyl orange, DPD oxalate, phenol red, brom cresol purple, and phenosafranin) were selected for detailed investigation. Free bromine, free chlorine, bromamines, and chloramines may be distinguished from one another. Free bromine alone may be determined by the brom cresol purple or phenosafranin tests. PS is the less sensitive of the two tests. Phenol red is a unique test for total bromine. The DPD and MO tests may be used to determine plus free chlorine. The DPD test serves well to indicate total halogen, if potassium iodide is added to the sample. The MO test is also suitable for the determination of total halogen, in the presence of bromide ion. To form bromamines in a water supply by addition of chlorine and bromide ion, these would have to be added to a small volume of the water at low pH to form free bromine, and subsequently this solution would have to be mixed with the remainder of the water to be treated. (Knapp-USGS)
W71-05576

ACCOMMODATING UNCERTAIN FORECAST IN SELECTING PLANT DESIGN CAPACITY,
Gesellschaft fur Klaranlagen und Wasserversc gung, Mannheim (West Germany).
Paul M. Berthouex.
Journal of the American Water Works Associatio Vol 63, No 1, p 14-20, January 1971. 7 p, 7 fig, tab, 38 ref.

Descriptors: *Optimization, *Water treatmen *Design, *Forecasting, *Water demand, *Safe factors, *Statistical methods, Economics, Decisi making, Growth rates.
Identifiers: *Uncertainty.

The purpose of this paper was to outline metho for quantitatively considering factors which in fluence the design capacity selection for wat treatment plants. The six factors considered were (1) the useful life of facilities; (2) the ease of e pansion; (3) the rate of growth of the service are (4) the rate of interest on the loan; (5) the chang in purchasing power during the debt period; an (6) the performance of the facilities during th early years. One other factor added was the learn ing curved effect, i.e. technological advances whic tend to offset the curse of inflation. The analysis was expanded to show how safety factors, expecte to provide an economic hedge against using uncer tain forecasts of demand were derived. A brie review of forecast errors and the concept of econo my of scale in construction was given. Linear an exponential demand forecasts were considered The economic objective was simply to minimiz long term costs, or to minimize expected long term costs when the forecast was treated as uncertain Simple demand growth situations were considered and two easily implemented optimization methods the Golden Section and the Hooke-Jeeves search were suggested for finding optimal design capaci ties. These two cases were said to give the planne upper and lower bounds on the demand capacity (Kriss-Cornell)
W71-05676

UTILIZATION OF ALKOXYSILANES FOR REDUCTION OF THE ABUNDANCE OF PHYTOPLANKTON DURING 'BLOOMS' OF WATER BASINS (IN RUSSIAN),
Moscow State Univ. (USSR).
N. S. Stroganov, V. G. Khobotiev, L. V. Kolosova, and M. A. Kadina.
Doklady Adademii nauk SSSR, Vol 181, No 5, p 1257-1259, 1968. 2 fig, 2 tab, 13 ref.

Descriptors: *Herbicides, *Algae, Toxicity, Scenedesmus, Chlorella, Daphnia, Deterioration, Water treatment, Degradation (Decomposition).
Identifiers: *Algal blooms, *Organo-silicates, *Al koxysilanes, Scenedesmus quadricauda, Chlorella vulgaris, Daphnia magna, Limnaea stagnalis, Ouspenskii's medium.

A search for herbicides suppressing algal blooms, but harmless to zooplankters and other hydrobionts lead to investigation of organo-silicates: venyl-triethoxysilane, tetraethoxysilane, and trifluoropropenyl- (methyl)-diethoxysilane. The test organism included Scenedesmus quadricaude, Chlorella vulgaris, Daphnia magna, and Limnaea stagnalis. The count of survived specimens showed that the concentration of 0.01 mg/liter of all investigated compounds eliminated 93% to 96% of algal cells without damaging either daphnia or mollusks. Among the advantages of the alkoxysilanes is their relatively rapid disintegration in water. (Wilde-Wisconsin)
W71-05719

FARM WASTES.
For primary bibliographic entry see Field 05D.
W71-05747

ORIGINS AND NATURE OF FARM WASTES: DISCUSSION,
Gowan, Douglas.
For primary bibliographic entry see Field 05B.
W71-05749

FARM WASTES: PUBLIC HEALTH AND NUISANCE PROBLEMS OFF THE FARM,
Chelmsford Rural District (Essex). Chief Health Inspector.
T. H. C. Bartrop.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 5, p 33-37, 1970. 5 ref.

Descriptors: *Public health, *Legislation, Farm wastes, Odors, Diseases, Bacteria.
Identifiers: *Public nuisance, Noise, Rats, Flies.

All nuisances and public health problems are preventable. To achieve this it is necessary to couple good siting and good design with good animal husbandry. Failure to do this voluntarily must inevitably lead to stricter planning control and the strengthening of public health law, for the development of intensive farming has outstripped controlling legislation. Agriculture, as an industry, claims certain privileges, but it cannot claim the privilege of causing a nuisance or a public health problem. (See also W71-05747). (Christenbury-Iowa State)
W71-05752

COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES: A QUARTER-CENTURY OF UNITED STATES ASSISTANCE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 03B.
W71-05821

5G. Water Quality Control

AN ENVIRONMENTAL SURVEY OF THE LOWER CLEARWATER RIVER,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W71-05336

MANAGEMENT OF AGRICULTURAL RESOURCES TO MINIMIZE POLLUTION OF NATURAL WATERS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
Ted L. Willrich.
Paper 4A1-3 of the National Symposium on Quality Standards for Natural Waters, University of Michigan, Ann Arbor, July 19-22, 1966. 18 p, 29 ref. OWRR Project A-013-IA (1).

Descriptors: *Water pollution control, *Water management (Applied), *Agricultural engineering, Soil conservation, Water conservation, Crop productivity, Irrigation programs, Soil chemistry, Soils.
Identifiers: Farm water management.

Managers of agricultural resources can adopt practices which will control, sustain or enhance pollution caused by agricultural operations and certain natural phenomena. However, water of inferior quality has existed and will continue to exist. Water pollutants of major concern which may result from crop and livestock production include: (1) sediment, (2) pesticides, (3) inorganic dissolved solids, particularly total salt content and nitrogen and (4) oxygen-demanding materials. Topography modification practices incorporate many of the principles of water-flow control to reduce or eliminate water pollution and erosion, including interception of precipitation, surface detention, silt deposition, soil infiltration, slow release of excess water, and degradation or attentuation of pollutants within the biologically and chemically active soil filter. Agricultural usage of pesticides can result in widespread, low-level surface water pollution through land runoff. Pesticides applied on or in the soil are generally fixed by soils or destroyed by soil microorganisms. Corrective practices to prevent oxygen-demanding materials in feedlot runoff from entering surface waters are available. (Knapp-USGS)
W71-05341

MODEL FOR FLOW AUGMENTATION ANALYSIS - AN OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
George R. Grantham, Edwin E. Pyatt, James P. Heaney, and Buford J. Carter, Jr.
ASCE Proceedings, Journal of the Sanitary Engineering Division, Vol 96, No SA5, p 1045-1055, October 1970. 11 p, 5 fig, 12 ref, append. FWQA Research Grant 16090 DRM, (formerly WP 1050).

Descriptors: *Low-flow augmentation, *Optimization, Water resources development, Systems analysis, Mathematical models, Linear programming, Regulation, Cost-benefit analysis, Waste dilution, Conjunctive use, Surface-groundwater relationships, Water pollution control.
Identifiers: Flow-augmentation benefits.

Beginning with the premise that the value of low flow augmentation is measured by sewage treatment cost avoided, a hydrologic flow simulator and a water quality linear programming model were interfaced to develop a procedure for determining a lower bound on the value of augmentation. This generalized approach can be applied by others to their specific water pollution control situations. The net benefit function may be determined with a comprehensive derivation of the flow augmentation cost function. This derivation includes not only direct costs, e.g., reservoir construction, but also imputed costs which reflect the value of water in alternative uses. These imputed costs may be important because of the relatively intensive demands for water which could be expected during low flow conditions. (Knapp-USGS)
W71-05365

AN ANALYSIS OF NEW JERSEY'S WATER POLLUTION CONTROL PROGRAM,
Rutgers-The State Univ., New Brunswick, N.J. Bureau of Government Research.
Philip H. Burch, Jr.
Available from NTIS as PB-197 884, $3.00 in paper copy, $0.95 in microfiche. Final technical report, New Jersey Water Resources Research Institute, New Brunswick, Part I (text), November 1970. 209 p. OWRR Project A-016-N.J. (1).

Descriptors: *State Government, Local Governments, Sewage Districts, Regions, Federal Government, Legal Aspects, Administrative Decisions, Planning, Standards, Monitoring, Regulation, *New Jersey, *Water pollution control, *Water quality control.

Prior to 1967 New Jersey's state water pollution control program was deficient in almost every significant respect. Up to the mid-1960's the state had not formulated any consistent set of water quality criteria to guide responsible authorities in the enforcement of an effective water pollution control program. The state health department's stream surveillance or monitoring program also left a great deal to be desired, for over the years there were not enough samples collected at various key points around the state to constitute a truly reliable indicator of water quality conditions. Furthermore, prior to the mid-1960's the state health department relied on what could best be described as variable effluent standards, specifications theoretically drawn up to meet each particular river valley or stream problem, but which were in fact of questionable validity and efficacy. And finally the actual enforcement record of the water pollution control arm of the state health department can only be characterized, up to the late 1960's, as one of extreme timidity or caution, particularly with reference to industrial waste discharge facilities. Fortunately, for the citizens of this highly urbanized and industralized state, there has been a substantial improvement in New Jersey's water pollution control program in recent years. Thanks largely to a rather drastic reorganization and shake-up of the state's water pollution control program--plus, as a result of pressure exerted by other agencies, the imposition of water quality criteria and effluent standards--New Jersey has now established a much more effective program in all major substantive areas other than water quality monitoring.
W71-05380

INSTITUTIONAL DESIGN FOR WATER QUALITY MANAGEMENT: A CASE STUDY OF THE WISCONSIN RIVER BASIN, VOL. 8, SECTION J - THE ECONOMIC AND FISCAL ASPECTS OF A REGIONAL WATER QUALITY MANAGEMENT SYSTEM,
Wisconsin Univ., Madison. Water Resources Center.
Anthony H. J. Dorcey.
Available from NTIS as PB-197 887, $3.00 in paper copy, $0.95 in microfiche. Report OWRR C-1228, 1970. 99 p, 13 fig, 13 tab. OWRR C-1228 (1601) (7).

Descriptors: *Water quality control, *Abatement, *Economics, *Cost sharing, *Wisconsin, Standards, Non-structural alternatives, Economic efficiency, Economics of scale, Value engineering, Cost-benefit analysis, Feasibility studies, Water policy, Project planning, Reservoirs.
Identifiers: *Wisconsin River Basin (Wis).

Criteria of economic efficiency, equity, and effectiveness are operationally defined and postulated as desirable in the design of policy to achieve regional water quality objectives. The Wisconsin River Basin is compared to the Ruhr Region and the Delaware Estuary in order to illustrate the uniqueness of effective and efficient policy design for any basin. The technological alternatives for influencing water quality in the Wisconsin River Basin and the nature of least-cost systems for achieving various quality objectives are described. The implementation of economically efficient systems through alternative policy arrangements are considered. The use of effluent charges as a policy mechanism on the Wisconsin River Basin are examined and it is concluded that they would be ineffective. An alternative policy arrangement which attempts to combine the advantages of regulation and economic incentive is suggested. This system-cost sharing arrangement attempts to effectively implement least-cost systems while meeting postulated criteria of equity concerning the distribution of costs and benefits of impounded water quality. (See also W71-05037 thru W71-05041) (Dorcey-Wisconsin)
W71-05383

MATHEMATICAL MODEL OF RECALCINATION OF LIME SLUDGE WITH FLUIDIZED BED REACTORS,
General American Transportation Corp., Niles, Ill.
For primary bibliographic entry see Field 05D.
W71-05387

PORK PRODUCERS AND POLLUTION: LEGAL ASPECTS,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
Donald P. Levi.
Paper delivered at the Annual Meeting of Missouri Pork Producers Association, January 16, 1970, Columbia, Missouri. Agricultural Economics Paper No. 1970-6. 15 p.

Descriptors: *Legal aspects, *Regulation, Farm wastes, Disposal, Missouri, Maintenance, Waste water treatment, Water pollution control.
Identifiers: *Pollution laws, *Lawsuits, Nuisance law, Liability, Stockmen, Law.

Pollution of water and air by feeding operations is becoming a very real problem. Whether this constitutes a nuisance is a question of fact and depends on the circumstances of each case. The relative interests of the parties involved will determine

whether or not a given operation is closed down. Even if one is legally allowed to continue in business, the assessment of actual or punitive damages may make it unprofitable to do so. There is no one thing which farmers can do to guarantee that they be free from nuisance actions. Site selection, proper maintenance, zoning and licensing may help in some cases. (Christenbury-Iowa State)
W71-05418

ANIMAL WASTES - A NATIONAL PROBLEM,
Cornell Univ., Ithaca. Dept. of Agriculture; and Cornell Univ., Ithaca. Dept. of Civil Engineering.
Raymond C. Loehr.
Proceedings of the American Society of Civil Engineers, Journal of the Sanitary Engineering Division, Vol 95, No SA2. 9 tab, 4 fig, 86 ref.

Descriptors: *Farm wastes, *Anaerobic digestion, *Aerobic treatment, Dehydration, Environment, Cattle, Hogs, Poultry, Sheep, Diets, Odors, Ruminants, Weight, Nitrogen, Phosphorus, Potassium, Waste water treatment, Confinement pens, Digestion, Proteins, Moisture content, Physical properties, Density, Chemical properties, *Water pollution sources, Waste dilution, Slurries, Biochemical oxygen demand, Runoff, Ammonia, Chemical oxygen demand, Oxygen demand, Nitrates, Surface waters, Effluents, Coliforms, Incineration, Aeration, Farm lagoons.
Identifiers: *Animal production, *Population equivalents, Fiber content, Manure production, Nuisance potential, Feedlots, Oxidation ditch, Slatted floors.

A state of the art summary is presented on the control and management of animal wastes. Items discussed include the magnitude of the problem, pollution that has been caused by animal wastes, feasible treatment processes, major problem areas, and areas for future activity. Animal production and their subsequent waste production, properties, and characteristics are discussed first. The pollution and nuisance potential is then pointed out with respect to population equivalents. Waste treatment and disposal processes and systems follow. A summary and conclusion point out problems and what direction should be taken in the future. The paper was 86 references. (White-Iowa State)
W71-05420

DIGITAL SIMULATION MODEL OF INORGANIC WATER QUALITY OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA, PROGRESS REPORT,
Nevada Univ., Reno. Center for Water Resources Research.
John V. A. Sharp, Richard L. Bateman, and Jerome A. Westphal.
University of Nevada, Desert Research Institute, Technical Report Series H-W, Hydrology and Water Resources Publication No 6, April 1, 1970. 21 p, 6 fig. FWPCA Program 16080 DPC.

Descriptors: *Model studies, *Digital computers, *Mathematical models, *Water quality, *Dissolved solids, Testing, Water management (Applied), Rivers, Waste disposal, Reservoirs, Water pollution, Planning, Water analysis, Flow, Flow measurement, Water quality control, Inorganic compounds, Hydrologic data, Stochastic processes, Analytical techniques, Equations, Nevada, California, Watersheds (Basins), Data collections, Input-output analysis, Parametric hydrology, Networks, Sampling, Environmental effects.
Identifiers: *Tahoe-Truckee River System.

This is a progress report on research to develop a digital model to simulate inorganic water quality in a complex system. For purposes of developing the model, the Tahoe-Truckee River System was studied. Regular and special analysis contributing to development and testing of the model are preliminary analyses of geology, geomorphic features, soils, and groundwater; daily stream flow records from many stations; monthly flow records; and reservoir storage and release records. The digital model, now approaching final stages of refinement, contains a hydrologic model providing monthly flows, a set of predictive equations, and a set of equations for simulating regulation. The purpose of the model is to describe and predict variation of water quality in terms of total dissolved solids so that accurate management decisions in areas of water quality control, waste disposal and pollution control can be made. By use of the model at its present state of refinement, the observed amounts of total dissolved solids is reasonably near the simulated amounts, and further development of the model is expected to produce more accurate simulation. Many parts of the model are given as formulae. (Yensen-Arizona)
W71-05469

EXECUTIVE ORDER 11548 (DELEGATED FUNCTIONS OF THE PRESIDENT UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-05488

DELEGATION OF RESPONSIBILITY TO CARRY OUT CERTAIN PROVISIONS OF FEDERAL WATER POLLUTION CONTROL ACT.
Executive Office of the President, Washington, D. C.
For primary bibliographic entry see Field 06E.
W71-05490

NATIONAL OIL AND HAZARDOUS MATERIALS POLLUTION CONTINGENCY PLAN.
Environmental Quality Council, Washington, D. C.
For primary bibliographic entry see Field 06E.
W71-05491

SEVERN RIVER WATERSHED--SEDIMENT AND WASTE CONTROL.
For primary bibliographic entry see Field 06E.
W71-05493

MUNICIPALITIES--SEWAGE DISPOSAL SYSTEMS--FINANCE, CONSTRUCTION AND OPERATION.
For primary bibliographic entry see Field 06E.
W71-05495

INTERSTATE SANITATION COMMISSION--TRI-STATE COMPACT--WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 06E.
W71-05496

TOWN OF PALM BEACH V CITY OF WEST PALM BEACH (CITY'S POWER TO CONDEMN OTHER CITY'S PROPERTY FOR SEWAGE DISPOSAL PURPOSES).
For primary bibliographic entry see Field 06E.
W71-05498

ATMOSPHERIC GAS EXCHANGE IN THE MARINE ENVIRONMENT,
Newark Coll. of Engineering, N.J. Dept. of Civil Engineering.
Ivan Metzger, and Su LING Cheng.
North Eastern Regional Antipollution Conference, Annual, Proceedings, Kingston, Rhode Island, p 27-30, July 22-25, 1969.

Descriptors: *Atmospheric physics, *Gases, *Organic wastes, *Aeration, *Turbulent flow, Water pollution control.
Identifiers: Atmospheric gas exchange.

One aspect of the determination of the capacity of receiving waters to assimilate organic pollution is aeration. Predicting the exchange of low solubility gases with turbulent fluid has been researched. The exchange of such gases with the marine environment can be represented by equations. In these equations the energy dissipation must be evaluated for systems which have wind-induced turbulence. A procedure for this evaluation is given. (Ensign-PAI)
W71-05502

ION EXCHANGE OF WASTE WATER FROM THE FOODSTUFF INDUSTRY,
Royal Danish School of Pharmacy, Copenhagen. Chemical Lab. A.
For primary bibliographic entry see Field 05D.
W71-05509

OFFSHORE-PETROLEUM AND THE ENVIRONMENT.

The Mines Magazine, 35th Annual Petroleum Issue, November 1970, p 10-17.

Descriptors: *Oil wastes, *Drilling, *Oil industry, *Environment, Marine animals, Costs, Exploration, Water pollution control.
Identifiers: *Santa Barbara spills, Environmental protection.

The reasons why it is so important to the nation's domestic security and growth for oil and gas exploration to continue are clarified. The actions to be taken by the petroleum industry to protect the life and beauty of the seas are presented. The major and minor spills and seepage in the Santa Barbara Channel are outlined and the petroleum industry gives their response to the many news articles on the Santa Barbara spills. (Ensign-PAI)
W71-05513

HARBOR DRIFT DISPOSAL,
Corps of Engineers, Washington, D.C.
Patrick A. DeScenza.
The Military Engineer, Vol 63, No 411, January-February 1971, p 31-33.

Descriptors: *Harbors, *New York, *Navigable waters, *Aquatic drift, *Solid wastes, *Waste disposal, Incineration, Water pollution control.
Identifiers: *Drifting debris, Derelict vessels, Shore structures, Dumping.

Each year 15,000 tons of drift and floating debris is removed from the navigable waters of New York Harbor. For many years, drift was disposed of by burning the debris on special floating barges anchored in upper New York Bay. This open burning process was improved from a pollution viewpoint by the addition of rows of water sprays which suppressed the fly ash and roughly scrubbed the gases of combustion. With the advent of stringent pollution controls and the increased emphasis on a cleaner environment, other methods of disposal had to be investigated. Following the investigations, the land-based overfire air-pit-type incinerator was selected as the best method of disposal. The incinerator features and its operations are described. (Ensign-PAI)
W71-05514

THE CANADIAN ARCTIC WATERS POLLUTION PREVENTION ACT: NEW STRESSES ON THE LAW OF THE SEA,
Wisconsin Univ., Madison. School of Law.
For primary bibliographic entry see Field 06E.
W71-05515

RECOVERY OF LARGE MARINE OIL SPILLS BY USE OF A VORTEX ASSISTED AIRLIFT SYSTEM,
Battelle Memorial Inst., Richland, Washington. Pacific Northwest Labs.
P. C. Walkup, J. D. Smith, and E. R. Simonson.
Paper presented at the 43rd Annual Conference, Water Pollution Control Federation, Boston, Massachusetts, October 4-9, 1970. 36 p, 18 fig, 17 ref.

Descriptors: *Oil wastes, *Water pollution control, *Mechanical equipment, *Vortices, Ocean waves, Emulsions, Flow rates, Winds, Surface waters, Pipes.
Identifiers: *Airlift system.

The Federal Water Quality Administration conducted studies on an apparatus for recovery of floating oil slicks. The device consists of a pump induced vortex and a vacuum suction or Coanda nozzle. A 1/8 inch thick slick could be recovered at the rate of 960 gallons per hour. The surface current generated by the vortex increased recovery rates 7.9 above that of the suction nozzle along. Coanda nozzle tests showed improved performance in surface waves. (Ensign-PAI)
W71-05526

THE USE OF COATED FABRICS IN CONTAINMENT OF PETROLEUM,
Firestone Coated Fabrics Co., Los Angeles, Calif.
Richard T. Headrick, and Edward E. Headrick.
Offshore Technology Conference, Second Annual, Preprints, Vol 1, Houston, Texas, April 22-24, 1970, p 227-238, 1970. 13 fig.

Descriptors: *Oil wastes, *Mechanical control, Water pollution control, Oil, Oily water.
Identifiers: *Coated fabrics, *Tents, *Booms, *Skimmers, *Tanks.

Coated fabric fuel containment has proven permanency and sharply reduced fire hazard when compared with conventional metal containers. Use of embarkment liner tanks with fabric floating roofs are often used for water reservoirs. Coated fabric tents have been installed for spill containment on the ocean bottom off Santa Barbara effectively collecting oil and gas seepage from the bottom and transferring the product to a floating collector tank. Another tent use is collecting fresh water from under water springs in the ocean. A collapsible oil containment boom for open ocean use and a skimmer system to receive oil from the boom legs is being developed. The boom does not attenuate or deflect wave energy, has little draft and freeboard and contours wave surface contours. All of these materials and their uses are described in detail. (Ensign-PAI)
W71-05530

TOVALOP - ITS ORIGIN, DEVELOPMENTS, STATUS, AND OBJECTIVES,
International Tanker Owners Pollution Federation, Ltd., London, England.
Arthur F. Tripp, Jr.
Tanker Conference. Fifteenth Annual, Addresses, Absecon, New Jersey, April 27-29, 1970, p 160-166, 1970.

Descriptors: *Oil wastes, *Ships, *Coasts, Water pollution control.
Identifiers: *Tankers, *Liability.

A plan by tanker owners concerning oil pollution of coastlines resulting from negligent oil discharge from their tankers, with the negligence being presumed unless the owner can establish that the tanker was not at fault, is presented. The plan obligates the owner to remove the oil and provides for reimbursement to a national government for expenses incurred in the removal. Liability limits are set at $100 per gross registered ton of the tanker involved or $10,000,000 whichever is less and financial capability is guaranteed as well as enforceability of claims through arbitration. Over 70% of the world tanker tonnage owners are presently members. The plans methods and objectives are analysed. National legislation and international convention activities are taken into consideration by the plan. Flexibility of the plan as a developing concept in oil pollution control is emphasized. (Ensign-PAI)
W71-05532

AN APPROACH TO ACQUISITION AND HANDLING OF SERIAL ENVIRONMENTAL DATA,
Westinghouse Ocean Research Lab., San Diego, Calif.
For primary bibliographic entry see Field 07C.
W71-05537

MANAGEMENT INFORMATION TECHNOLOGY FOR WASTE MANAGEMENT AND MULTIMISSION ORIENTED RESEARCH,
Federal Water Quality Administration, Washington, D.C. Office of Research and Development.
G. F. Wirth.
1970 IEEE International Conference on Engineering in the Ocean Environment, Panama City, Florida, September 21-24, 1970, Digest of Technical Papers, p 42-44.

Descriptors: *Wastes, *Water pollution control, *Management, *Technology, Computer programs.
Identifiers: *Management information systems, *Research and development, FWQA research system.

Management information system technology to identify, collect, and present information for pollution control or waste management is studied. Federal Water Quality Administration's Research, Development and Demonstration Program is discussed. The way in which information is brought to decision-making in the selection of results sought, implementation of plans in obtaining the results, and the communication of results to potential users is outlined. (Ensign-PAI)
W71-05541

CONGRESS PASSES WATER QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-05542

U.S. AND UN DEBATE MAN'S USES AND ABUSES OF THE SEA.
For primary bibliographic entry see Field 06E.
W71-05543

RIM OF THE SEA BECOMING CROWDED AND DIRTY.
For primary bibliographic entry see Field 06E.
W71-05544

THE FEDERAL-STATE PARTNERSHIP IN MANAGING THE COASTAL ZONE,
Department of the Interior, Washington, D.C.
S. Fred Singer.
Texas Marine Resources and the Sea Grant Program, Conference Proceedings, College Station, Texas, January 16-17, 1969. Texas A and M University, Sea Grant Program, Sea Grant Publication No 102, p 135-145, October 1969.

Descriptors: *Water quality, *Management, *Federal governments, *State governments, *Estuaries, Water pollution control, Coasts.

All levels of government have a great stake in their estuaries which are immensely valuable and which are constantly endangered by pollution. A long range management scheme should be based on some effective use allocation, with complete knowledge of an estuary's development potential and its vulnerability to destruction. The study of estuaries scientifically, technically, economically and socially and then the construction of an optimum mangement structure for the nation's estuarine zone to serve public and private needs in the best possible way was indicated. (Ensign-PAI)
W71-05546

UNITED KINGDOM STUDIES ON RADIOACTIVE MATERIALS RELEASED IN THE MARINE ENVIRONMENT,
Atomic Energy Research Establishment, Harwell (England).
H. J. Dunster.
Biological Implications Of The Nuclear Age, Symposium, Proceedings, Livermore, California, AEC Lawrence Radiation Laboratory, Bio-Medical Division, Oak Ridge, Tennessee, p 145-155, December 1969. 5 tab, 14 ref.

Descriptors: *Radioactive wastes, *Waste disposal, *Coasts, Water pollution control, *Monitoring, Liquid wastes.
Identifiers: United Kingdom.

The current policy for the disposal of radioactive wastes in the United Kingdom is summarized. The development of discharge criteria, the current basis of control and the results of the monitoring program are discussed. A high standard of safety is achieved by the various government departments so that there is no damage to the marine environment and no limitation on man's use of that environment. Control of the discharges of liquid waste from the fuel-reprocessing plant at Windscale into the Irish Sea is used as an example of their policy in practice. (Ensign-PAI)
W71-05551

RHINE RIVER POLLUTION STUDIES,
For primary bibliographic entry see Field 05B.
W71-05581

BIOASSAY PROCEDURES FOR OIL AND OIL DISPERSANT TOXICITY EVALUATION,
National Marine Water Quality Lab., Kingston, R.I.
For primary bibliographic entry see Field 05C.
W71-05632

STREAM QUALITY MODELING BY QUASILINEARIZATION,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee, and Irving Hwang.
Journal Water Pollution Control Federation, Vol 43, No 2, p 306-317, February 1971. 12 p, 2 fig, 8 tab, 6 ref.

Descriptors: *Water quality control, *Stream improvement, *Estimating equations, *Mathematical models, Biochemical oxygen demand, Dissolved oxygen, Boundary processes, Data collections, Least squares method.
Identifiers: *Quasilinearization technique, Parameters.

An introduction to a fairly effective technique for estimating parameters or coefficients in differential equations arising in stream quality modeling was proposed. The parameter estimation problem was treated as a two-point or multipoint boundary-value problem by the quasilinearization technique. To illustrate the approach, a simple representation of stream quality proposed by Camp and Dobbins which considered BOD concentration and DO deficit was shown. First, only three data points were available for estimating the rate constants. Then it was desirable to obtain a fairly large amount of data instead of just three data points. A classical least squares criterion was used where parameters were determined so that the sum of the squares of the deviations was minimized. Since the equations used were nonlinear systems with multipoint boundary conditions and could not be solved analytically, the quasilinearization technique, or the generalized Newton-Paphson method, was used and the computational procedure was given in detail. Numerical results included estimation of two parameters, estimation was experimental errors, and estimation of three parameters. A more general estimation problem which used five unknown parameters was also solved by the linearization operation. (Kriss-Cornell)
W71-05679

MODELING AND OPTIMIZATION OF WATER QUALITY IN STREAMS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.

Rekha S. Rege.
Master's Thesis, Kansas State Univ, 1970. 123 p, 22 fig, 9 tab, 101 ref, 4 append. OWRR Project B-015-KAN (1).

Descriptors: *Optimization, *Mathematical models, *Water quality control, *Cost-benefit analysis, *Stream improvement, Dispersion, Biochemical oxygen demand, Dissolved oxygen, Water treatment, Constrants, Continuity equation.

A steady state on dimensional dispersion model was developed to represent the BOD and DO balances in a stream having several outfalls of waste and intakes of water. The model also included continuous additions and removals of BOD and DO along the stream. In the presentation, a literature survey was made dealing with the development of deterministic models for describing water quality in streams and water quality management models using a deterministic approach. Then a complete description of the formulation of the dispersion model was given. For the purpose of analysis the stream was divided into several segments, each segment beginning at the location of a waste outfall or water intake. The solution was derived by applying continuity equations at the boundary of each segment, and equilibrium conditions at the ends of the stream which were assumed to be infinitely long. The model was extended to incorporate waste treatment plant models at the location of waste outfalls, and water treatment plant models at the intakes. The optimal waste discharge policy along a stream was investigated based on a program of minimizing the total cost benefit function. The feasibility of obtaining a solution by a search technique capable of handling nonlinear constraints on water quality was studied. Application to a hypothetical stream and model use in future research were discussed. (Kriss-Cornell)
W71-05684

INTEGRATION OF CONNECTICUT WATER RIGHTS LAWS AND POLLUTION CONTROL LAWS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 06E.
W71-05718

WATER POLLUTION PREVENTION REQUIREMENTS IN RELATION TO FARM-WASTE DISPOSAL,
Thames Conservancy (England). Chief Purification Officer.
H. Fish.
Proceedings of Symposium: Farm Wastes: The Institute of Water Pollution Control and The University of Newcastle upon Tyne, Paper No 6, p 38-43, 1970.

Descriptors: *Farm wastes, *Legal aspects, Biochemical oxygen demand, Water pollution sources, Water quality control, Runoff, River regulation, Riparian waters, Groundwater, Legislation, *Disposal.
Identifiers: *United Kingdom, River authority, Common Law.

This article is concerned with the legal aspects of pollution and how they apply to agriculture. The ways in which farm waste can pollute water supplies and means of limiting the pollution effects are discussed. Large units located in close proximity to urban areas present the most difficult problems. Through cooperation between farmers and the river authority, the pollution effects of farm waste can be held at a minimum. (See also W71-05747). (Christenbury-Iowa State)
W71-05753

SEWERS AND SEWAGE TREATMENT,
Chartered Civil Engineers, London (England); Newcastle-upon-Tyne Univ. (England).
For primary bibliographic entry see Field 05D.
W71-05754

KELLY V KANSAS CITY BLDG AND LOAN ASS'N (LIABILITY TO ADJOINING LANDOWNER FOR OVERFLOW OF SEPTIC TANK).
For primary bibliographic entry see Field 06E.
W71-05772

WATER-QUALITY STUDIES ON THE KALAMAZOO RIVER,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 05B.
W71-05774

BACKGROUND PAPERS ON COASTAL WASTES MANAGEMENT.
National Academy of Sciences-National Research Council, Washington, D.C. Committee of Oceanography; and National Academy of Engineering, Washington, D.C. Committee on Ocean Engineering.
For primary bibliographic entry see Field 05B.
W71-05787

A DIGEST OF ENVIRONMENTAL POLLUTION LEGISLATION IN CANADA, WATER.
Canadian Industries Ltd., New Toronto (Ontario).

Canadian Council of Resource Ministers, May 1970. 362 p.

Descriptors: *Water pollution control, *Environmental sanitation, *Legislation.
Identifiers: *Canada, *Federal legislation, *International Joint Commission, *Province legislation.

The environmental pollution legislation enacted by the eleven senior governments of Canada is presented as a reference for Canadians concerned with judicious management of environmental resources. Federal legislation, the International Joint Commission, and pollution and the common law are included along with acts and agencies of the different provinces of Canada. (Ensign-PAI)
W71-05804

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER. VOLUME I - SUMMARY.
International Lake Erie Water Pollution Board; and International Lake Ontario-Saint Lawrence River Water Pollution Board.

Report to the International Joint Commission on the Pollution of Lake Erie, Lake Ontario and the International Section of the Saint Lawrence River, Volume I, Summary, 1969. 151 p, 4 fig, 11 tab, 5 plate.

Descriptors: *Pollutants, *Physicochemical properties, *Biological properties, Water pollution sources.
Identifiers: Lake Erie, Lake Ontario, St. Lawrence River.

Lake Erie, Lake Ontario and the international section of the Saint Lawrence River are being polluted on both sides of the U.S.- Canadian boundary. Flow studies conducted by agencies in both countries indicate that there is substantial mixing of these waters to have made concentration levels of pollutants uniform throughout each of these bodies of water. Pollution sources, character and disposition of waste inputs, water quality problems, water quality objectives and remedial measures including institutional arrangements and legislation are presented. (See also W71-05806 and W71-05807) (Ensign-PAI)
W71-05805

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE SAINT LAWRENCE RIVER, VOLUME III LAKE ERIE.
International Lake Erie Water Pollution Boa and International Lake Ontario-Saint Lawren River Water Pollution Board.

Report to the International Joint Commission the Pollution of Lake Erie, Lake Ontario and t International Section of the Saint Lawrence Riv Volume II, Lake Erie, 1969. 151 p, 5 fig, 8 ref.

Descriptors: *Water pollution sources, *Pollutan *Physicochemical properties, *Biological propo ties.
Identifiers: Lake Erie.

A description of the physical features, land a water uses and nearby populations of Lake Erie presented as background to this pollution stud Pollution sources, physico-chemical and biologic characteristics, and developing problems are st died and the effects of these factors are evaluate Water quality objectives are discussed. (See al W71-05805) (Ensign-PAI)
W71-05806

POLLUTION OF LAKE ERIE, LAKE ONTARI AND THE INTERNATIONAL SECTION OF TH SAINT LAWRENCE RIVER. VOLUME III LAKE ONTARIO AND THE INTERNATIONA SECTION OF THE SAINT LAWRENCE RIVER R
International Lake Erie Water Pollution Boar and International Lake Ontario-Saint Lawrenc River Water Pollution Board.

Report to the International Joint Commission o the Pollution of Lake Erie, Lake Ontario and th International Section of the Saint Lawrence Rive Volume III - Lake Ontario and the Internationa Section of the St. Lawrence River.

Descriptors: *Water pollution sources, *Pollutants *Physicochemical properties, *Biological proper ties.
Identifiers: Lake Ontario, Saint Lawrence River.

A description of the physical features, water use and nearby populations of Lake Ontario and the in ternational sections of the Saint Lawrence River i presented as background for a pollution study o these areas. Pollution sources, physico-chemica and biological characteristics and the effects o material inputs are investigated and objectives fo prevention, control and removal are discussed (See also W71-05805) (Ensign-PAI)
W71-05807

INTERNATIONAL LEGAL CONFERENCE ON MARINE POLLUTION DAMAGE, FINAL ACT OF THE CONFERENCE WITH ATTACHMENTS INCLUDING THE TEXTS OF THE ADOPTED CONVENTIONS.
Inter-Governmental Maritime Consultative Or ganization, London.

International Legal Conference on Marine Pollu tion Damage, 1969, Final Act of the Conference with Attachments Including the Texts of the Adopted Conventions. 88 p. IMCO No 1970.3.

Descriptors: Water pollution effects, *Oil wastes, *International law, Conferences, *Water pollution control, Legislation.
Identifiers: Conciliation, Arbitration, *Civil liability, Insurance, Resolutions.

The final act of the Conference on Marine Pollution Damage, 1969 is presented. The texts of the adopted conventions are discussed. Included in this is the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties and the International Convention on Civil Liability for Oil Pollution Damage. Resolutions are set forth. (Ensign-PAI)
W71-05810

OIL SPILL CONTROL SURVEY FOR ONSHORE AND OFFSHORE FACILITIES.
American Petroleum Inst. Committee for Air and Water Conservation.

American Petroleum Institute, Report No 4023, March 1970. 382 p, 8 tab, 4 append. A.P.I. Report Number 4023.

Descriptors: *Oil industry, *Oil wastes, *Water pollution control, *Surveys, Oily water, Coasts.
Identifiers: Prevention, Cleanup.

A survey was conducted in 1969 by a Petroleum industry task force to collect information on all oil facilities operating in all fifty states bordered by navigable waters. The objective of this survey was to obtain information for planning future programs to improve the capabilities of all oil handling facilities in combating oil spills by prevention, containment and cleanup. (Ensign-PAI)
W71-05812

EXECUTIVE ORDER 11523, ESTABLISHING THE NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL.
For primary bibliographic entry see Field 06E.
W71-05814

ABANDONED MINE DRAINAGE CONTROL ACT OF 1970 (LAND RECLAMATION FOR WATER POLLUTION CONTROL).
For primary bibliographic entry see Field 06E.
W71-05819

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

COMPUTER SIMULATION OF PHYTOPLANKTON GROWTH NEAR A MARINE SEWAGE OUTFALL,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W71-05506

SIMULATION OF THE HYDROLOGIC CYCLE ON SMALL AGRICULTURAL WATERSHEDS BY DIGITAL TECHNIQUES,
Virginia Polytechnic Inst., Blacksburg. Dept. of Agricultural Engineering.
V. O. Shanholtz, and J. H. Lillard.
In: Virginia Polytechnic Institute and State University Water Resources Research Center Bulletin 40, p 19-41, December 1970. 23 p, 16 fig, 5 ref.

Descriptors: *Model studies, *Mathematical models, *Simulation analysis, Digital computers, Systems analysis, Synthetic hydrology.
Identifiers: *Stanford Watershed Model.

Digital simulation models express the physical system of a watershed as a collection of mathematical expressions. Probably the most comprehensive of these is the Stanford Model. It consists of a group of mathematical expressions which establish relationships between the elements of the hydrologic cycle and the interactions between its components. The model is normally operated with known input and output and the different model parameters are optimized until an acceptable fit is achieved. Two agricultural watersheds (Brush Creek and Crab Creek), having areas of approximately 800 acres and located near Blacksburg, Virginia, were selected for study because they consistently reacted quite differently to given rainfall experiences. Five years of recorded data were used to calibrate the model to each watershed after which five additional years of streamflow records were generated using the respective model parameters developed for the first period. For the most part, the model appears to simulate the hydrologic process of a watershed within the accuracy of basic input data. The model can provide approximations for the practicing engineer that would be difficult to obtain otherwise. (See also W71-05555) (Knapp-USGS)
W71-05557

WATER RESOURCES PLANNING AND HYDROLOGIC RISK,
Cornell Univ., Ithaca, N.Y. Dept. of Water Resources Engineering.
Daniel P. Loucks.
Proceedings of Columbia University Seminar on Pollution and Water Resources, Volume I, 1967-1968, Columbia University, New York, NY, 1971, p 27-39. 13 p, 7 fig, 4 tab.

Descriptors: *Stochastic processes, *Mathematical models, *Optimization, *Water resources development, *Hydrologic aspects, *Risks, Planning, Management, River basins, Linear programming.
Identifiers: Deterministic model.

Some deterministic and stochastic models that were structured for defining and selecting alternative policies for managing (designing and operating) river basin systems were presented. The stochastic models explicitly considered hydrologic risk. Their solutions were compared to solutions obtained from deterministic models to determine the influence of risk on water resources planning. Discrete probabilities were used to approximate the continuous probability distributions of streamflow, reservoir volumes, and other hydrologic events, and discrete intervals of time were used to describe the continuous variable time. The models developed were solely for the preliminary screening of alternatives. They were static models for suggesting what the resource management policies should be, given some estimate of future economic, social and technological conditions. A review of the probability theory that forms the core of many of the stochastic models was given. The problem of determining reservoir capacity, reservoir storage and draft targets, and the reservoir operating policy that maximizes the expected net benefits was used as a numerical example. The deterministic model was presented and then was structured as a stochastic linear programming design model. A third model, called the 'operating policy' model, was developed to complete the multiple-used water resource system. An optimal solution from the two-stage process was obtained. (Kriss-Cornell)
W71-05677

GEOMETRIC PROGRAMMING AND THE PRELIMINARY DESIGN OF INDUSTRIAL WASTE TREATMENT PLANTS,
Rensselear Polytechnic Inst., Troy, N.Y. Dept. of Mathematics; and Union Coll., Schenectady, N.Y. Dept. of Economics.
For primary bibliographic entry see Field 05D.
W71-05680

SENSITIVITY ANALYSIS: A NECESSITY IN WATER PLANNING,
Texas A and M Univ., College Station; Dept. of Industrial Engineering.
W. L. Meier, A. O. Weiss, C. D. Puentes, and Joe C. Moseley.
US Dept of the Interior, 1971. 15 p, 8 fig, 1 tab, 3 ref. Office of Water Resources Research Project B-059-TEX (1).

Descriptors: *Optimization, Simulation analysis, *Computer models, *Water resources development, *Planning, Variability, Cost, Inflow, Reservoir operation, Texas.
Identifiers: *Sensitivity analysis.

Sensitivity analysis was shown to be of significant utility to the planner through presentation of a computer simulation and optimization model which quantified possible variations in system response as a result of uncertainty in the physical and economic conditions of a water resource system. A portion of the Texas Water System was used for the analysis and consisted of 12 reservoirs, 8 river reaches, and 34 pump canals. The system collected excess water in East Texas and transported these waters along with imports from in-state and out-of-state sources to points of high demand in West Texas. A 36-year demand build-up and simulation period was used. A historic filled-in data set and 18 selected synthetic data sets comprised of monthly demand, net evaporation and reservoir inflows were developed using data at all available flow measurement sites and a data filled-in and stochastic data generation procedure. The basic analytical tool used, the SIM III program developed by the Texas Water Development Board and Water Resources Engineers, Inc., was a detailed network simulation/optimization program with a minimum cost objective function on a monthly basis. The model considered evaporation data, import availability, streamflow data, and cost. Reservoir starting contents and size and sequence of canals were used to show response changes in the system. (Kriss-Cornell)
W71-05681

OPTIMIZING THE LONG RANGE OPERATION OF THE CALIFORNIA AQUEDUCT BY INCREMENTAL DYNAMIC PROGRAMMING SIMULATION,
California Univ., Berkeley. Operations Research Center.
I. Haissman, J. L. Matucha, and R. W. Shephard.
Operations Research Center, College of Engineering, University of California, ORC 70-44, December 1970. 41 p, 5 fig, 7 tab. National Science Foundation Grant No GK-23153.

Descriptors: *Optimization, *Dynamic programming, *Simulation analysis, *Computer programs, *Aqueducts, California, Reservoirs, Pumping, Monthly, Constraints.
Identifiers: Water release, Trajectories.

An exploration of the possibility of using incremental methods in dynamic programming to compute pumping and release monthly schedules which minimize the cost of contracted firm power for the operation of the Aqueduct system of the State of California was described. For this purpose the state of the aqueduct at any time was defined by water levels in the five reservoirs of the system. Pumping on the aqueduct and releases of water from the reservoirs result from changes in these five state variables which were traced out by simulation of the system using engineering data on gravity flows in the aqueduct, discharges of pumps and outputs of power at the three generating plants, allowing for deliveries of water to users, and evaporation of water along the way. For each of 120 months, the operation of the system was defined by a five dimensional state variable vector, implying certain releases and pumping of water determined by simulation. A set of 120 such ordered five dimensional vectors defines a trajectory in a state-time space prescribing the operation of the aqueduct over a ten-year period. A computer program was assembled and run to show feasible trajectories which satisfy a variety of constraints for pump capacities, storage of water in reservoirs, generation capacities and surge limitations for the canals. (Kriss-Cornell)
W71-05682

UNBALANCED TENSIONS IN TRANSMISSION LINES,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 08C.
W71-05726

SYSTEMS ENGINEERING IN WATER RESOURCES,
Environemtnal Dynamics, Inc., Los Angeles, Calif.
John A. Dracup.
In: Report on 5th Annual Water Resources Research Conference, Sponsored by the Office of Water Resources Research, Dept. of the Interior, Washington, DC, p 171-176, Feb 3-4, 1970. 4 ref.

Descriptors: *Systems analysis, Research and development, Water policy.
Identifiers: *Water resources planning, Comprehensive planning.

Systems engineering is the art and science of selecting from a large number of feasible alternatives that set of actions which will best accomplish the overall objectives of decision-makers. Model building, linear programming, dynamic programming, and simulation are discussed. Current techniques being used by water resources researchers include multilevel optimization using both linear and dynamic programming. Water resource systems engineering has involved application of certain techniques of optimization and operations research to actual or hypothetical systems. Research efforts are moving towards including the stochastic and dynamic aspects of problems in the analysis. Also, research efforts are moving towards tying together several different techniques such as a linear and dynamic programming or mathematical programming and simulation in a multilevel optimazation approach. Needed research seems to be in two areas: (1) taking a single complex water resource configuration and applying several techniques and approaches, and (2) tying together piecemeal approaches in a regional concept. This analysis could then be expanded to include maximizing the benefits from the transportation, education and health inputs to the region. (Wray-Chicago)
W71-05786

6B. Evaluation Process

METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS; REPORT OF EVALUATION OF MINERALS AND MINERAL POTENTIAL OF THE SALMON RIVER DRAINAGE BASIN IN IDAHO SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research Inst.
C. N. Savage.
Available from NTIS as PB-197 885, $3.00 in paper copy, $0.95 in microfiche. University of Idaho Water Resources Research Institute, Scenic Rivers Study Unit, September 1970. 64 p, 8 tab, 15 fig, 28 ref. OWRR Proj B-014-IDA (5).

Descriptors: *Mineralogy, *Mining, *Idaho, *Wild River Act, *Wild rivers, *Evaluation, Mining industry, Metals, Geology, Economic prediction, Water resources, Rivers, Maps, Data collections, Watersheds (Basins), Natural resources.
Identifiers: *Salmon River (Idaho).

Important ores and minerals found in the upper Salmon River drainage basin of central Idaho are listed along with the mining history of each, and amounts of ore and approximate market values where known. A large, important table includes import-export data, consumption, and stockpile information for 29 minerals and ores. Another table evaluates effects of various modern mining methods upon the environment. Fifteen full-page maps of the state of Idaho pinpoint mineral locations and geological formations. A very significant amount of mineral resources lies within the drainage basin under study, and the value of these resources should be considered when drafting regulations governing the use of wild rivers areas. (Yensen-Arizona).
W71-05381

EFFECT OF WATER RESOURCES ON ECONOMIC GROWTH IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
For primary bibliographic entry see Field 06D.
W71-05382

INSTITUTIONAL DESIGN FOR WATER QUALITY MANAGEMENT: A CASE STUDY OF THE WISCONSIN RIVER BASIN, VOL. 8, SECTION J - THE ECONOMIC AND FISCAL ASPECTS OF A REGIONAL WATER QUALITY MANAGEMENT SYSTEM,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05G.
W71-05383

METHODOLOGICAL ASPECTS OF TECHNICO-ECONOMIC PARAMETERS OF NUCLEAR DESALINATION PLANTS,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
For primary bibliographic entry see Field 03A.
W71-05404

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Water Resources Research Inst.
E. L. Michalson, and Larry Kirkland.
Idaho University Water Resources Research Institute Progress Report No 1, 1969. 33 p. OWRR Project B-014-IDA (7).

Descriptors: *Scenery, *Recreation, *Wild rivers, *Idaho, Aesthetics, Water use, Conservation, Wild River Act, Streams, Rivers.
Identifiers: *Scenic rivers, Salmon River (Idaho).

The Salmon River, Idaho and its basin has been selected to develop a model system to evaluate wild and scenic rivers. The study involves an inventory of the natural and human resources of the area, estimates of future demands for quantities of these resources, and identification, description, quantification, where possible, of benefits from scenic beauty, personal enrichment, and other esthetic experiences derived from a river. A series of economic models were attempted to evaluate and determine resource use patterns consistent with a Wild and Scenic Rivers System, to compare them with resource use patterns under varying levels of development. A field survey of recreation uses was made in all the major recreational areas of the Salmon River. (Knapp-USGS)
W71-05623

ANNUAL REPORT 1970.
Institute for Water Resources (Army), Alexandria, Va.

Institute for Water Resources, February 1971. 27 p, 4 append.

Descriptors: *Cost-benefit analysis, *Planning, Water resources development, Research and development, Training, Education, *Social aspects, *Cost comparisons, Cost analysis, Cost allocation, *Environmental effects, *Evaluation.
Identifiers: *Public participation.

This is the second Annual Report of the Institute for Water Resources, covering the activities and accomplishments of the calendar year 1970 and projected activities and plans for the future. Section 1 indicates the Organization and Professional Staff of the Institute for Water Resources as of 31 December 1970. Section 2 lists 12 IWR studies which had been published as of 31 December 1970. The 12 research studies completed during 1970 are briefly described. Nine research projects are either under way or planned. Brief discussions are presented on professional development, consultative and problem-solving services, and training liaison.
W71-05663

OPPORTUNITIES FOR DEVELOPMENT OF RIVER PORTS ON THE ARKANSAS RIVER WATERWAY SYSTEM, KEOTA, OKLAHOMA.
Garver and Garver, Inc., Little Rock, Ark.

Available from NTIS as PB-191 310, $3.00 [illegible] paper copy, $0.95 in microfiche. Economic Development Admin, Dept of Commerce, [illegible] 1970. 45 p.
Identifiers: *Urban planning, *Oklahoma, *Inland waterways, Harbors, *Harbors, Site selection, Economics, Commerce, Industrial plants, Transportation, *Arkansas River waterway system, *Marine terminals, *River basin development, *Area planning and development, *Arkansas River, *Keota (Okla), *Haskell County (Okla).

The considerations entering into the findings [illegible] ported include: (1) Analyses of the population and economy of the area; (2) a review of recent industrial development and current planning for the acquisition of new industry; (3) local transportation facilities as related to potential port sites; (4) an evaluation of sites suitable for port and industrial development; and (5) estimates of development costs. An extensive Appendix, included as a part of this report, contains data of value to organizations interested in river port and industrial development including: (1) Criteria for site selection; (2) measures for preserving sites suitable for development; (3) the use of air and water pollution and physical blight controls; (4) various methods of financing including Federal assistance programs; and (5) procedures for attracting industry to port-related sites. (See also W71-05665)
W71-05664

OPPORTUNITIES FOR DEVELOPMENT OF RIVER PORTS ON THE ARKANSAS RIVER WATERWAY SYSTEM, DARDANELLE-RUSSELLVILLE, ARKANSAS.
Garver and Garver, Inc., Little Rock, Ark.

Available from NTIS as PB-191 314, $3.00 in paper copy, $0.95 in microfiche. Economic Development Admin, Dept of Commerce, [illegible] 1970. 53 p.
Identifiers: *Urban planning, *Arkansas, *Inland waterways, Harbors, *Harbors, Site selection, Economics, Commerce, Industrial plants, Transportation, *Arkansas River waterway system, *Marine terminals, *River basin development, *Area planning and development, *Arkansas River, *Dardanelle (Ark), *Russellville (Ark), *Pope County (Ark), *Yell County (Ark), *Johnson County (Ark).

The considerations entering into the findings reported include: (1) Analyses of the population and economy of the area; (2) a review of recent industrial development and current planning for the acquisition of new industry; (3) local transportation facilities as related to potential port sites; (4) an evaluation of sites suitable for port and industrial development; and (5) estimates of development costs. An extensive Appendix, included as a part of this report, contains data of value to organizations interested in river port and industrial development including: (1) Criteria for site selection; (2) measures for preserving sites suitable for development; (3) the use of air and water pollution and physical blight controls; (4) various methods of financing including Federal assistance programs; and (5) procedures for attracting industry to port-related sites. (See also W71-05664)
W71-05665

A COMPREHENSIVE PLAN STERLING, ILLINOIS.
Sterling City Planning Commission, Ill.

Available from NTIS as PB-190 956, $3.00 in paper copy, $0.95 in microfiche. Wm S Lawrence and Associates, Inc. Chicago, Illinois, July 1969. 157 p.
Identifiers: *Urban planning, *New York, Terrain, Population, Budgets, Recreation, Classification, Drainage, Roads, Transportation, Fire safety, Police, Water supplies, Public health, Sanitary engineering, Education, Structural properties, Housing, Costs, Law, *Colden (New York), *Erie County (New York), Land use zoning, Land use.

The report contains all the basic studies for a comprehensive plan for the Town of Colden. The specific topics covered are land use, physical features, neighborhood analysis, population, municipal facilities, educational facilities, circulation and transportation, economic base analysis, and municipal finance. For each of the aforementioned studies a survey was made of existing conditions and/or facilities, where appropriate, projections for the future were made, and their implications for planning were noted. The basic studies indicate that Colden's popularity as a winter sports area will continue. Because of topographic limitations, suburban expansion will not be as extensive in Colden as in other areas. However, some suburban expansion from Buffalo will occur, and the Town through zoning and other land use controls, should insure that future residential developments is compatible with the present character of Colden. This volume not only provides a general frame of reference but provides specific guidelines for the Comprehensive Master Plan and for plan implementation. (Author)
W71-05670

SOME COMMENTS ON LINEAR DECISION RULES AND CHANCE CONSTRAINTS,
Cornell Univ., Ithaca, N.Y. Dept. of Water Resources Engineering.
Daniel P. Loucks.
Water Resources Research, Vol 6, No 2, p 668-671, April 1970. 4 p, 3 ref. OWRR Project C-1034.

Descriptors: *Linear programming, *Constraints, *Stochastic processes, *Evaluation, *Mathematical models, *Reservoir operation, Management, Decision making, Storage capacity.
Identifiers: Reservoir release.

A recent paper by ReVelle et al. entitled 'The linear decision rule in reservoir management and design, 1, Development of the stochastic model' (1969) in which the authors structured some simple chance constrained linear programming models for determining the reservoir capacity required to maintain a range of storage volumes and releases some specified fraction of the time was discussed. Their paper was described as among the clearest introductions to the application of probabilistic or chance constraints and their deterministic equivalents ever seen. It was said to be one of the first stochastic modeling techniques that could be extended to a multireservoir problem. A review of the authors' stochastic model was given and then was compared with a linear release rule that included the current inflow which would result in a smaller required reservoir capacity. In addition, there was discussion of what the authors called control volume K. A paper by Young (1967), cited as justification for using linear rules in their presentation, also received comment. (Kriss-Cornell)
W71-05675

A SPATIAL ALLOCATION MODEL FOR PROJECTED OUTDOOR RECREATION DEMAND: A CASE STUDY OF THE CENTRAL UPSTATE NEW YORK REGION,
New York State Coll. of Agriculture, Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06D.
W71-05678

MODELING AND OPTIMIZATION OF WATER QUALITY IN STREAMS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W71-05684

A METHODOLOGY STUDY FOR EVALUATION OF WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Water Resources Research Inst.

Michalson, E.L., Project Leader. University of Idaho, Water Resources Research Institute, Scenic Rivers Study Unit, September 1970. 8 p, 1 fig. OWRR Project B-014-IDA (9).

Descriptors: *Wild River Act, *Wild rivers, *Water resources, *Planning, *Evaluation, *Model studies, Water utilization, Economics, Research and development, River regulation, Rivers, Idaho, Natural resources, Water types, Census, State governments, Federal government, Benefits.
Identifiers: *Salmon River (Idaho).

The goal of this study unit is to develop criteria which can be used to determine values of proposed wild rivers and study rivers. Natural and human resources will be developed to try to quantify aesthetic, scenic, and personal benefits derived from the rivers. Alternatives for resource use with economic and social benefits will be studied. The Salmon was selected as the test river for these studies. Categories of rivers such as non-system rivers, wild rivers, scenic rivers, and recreation rivers will be proposed and methods of evaluating and classifying rivers developed. Fourteen subprojects were adopted for study: forest and range resources, minerals, outdoor recreation, commercial fisheries, irrigation, water for municipal and industrial use, water quality control, hydroelectric power, flood control, navigation, transportation and access, anthropology, history and agriculture. Data from these subprojects will be used to develop economic models to aid in evaluating alternative uses of water resources in the river basin area. A list of participating agencies and personnel is given. (See also W71-05703 and W71-05704) (Yensen-Arizona)
W71-05702

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS; REPORT OF FLOOD CONTROL SUBPROJECT,
Idaho University, Moscow. Water Resources Research Inst.
John J. Peebles.
Available from NTIS as PB-197 997, $3.00 in paper copy, $0.95 in microfiche. University of Idaho Water Resources Research Institute, Report, February 1970. 79 p, 12 tab, 33 fig. OWRR Project B-014-IDA (8).

Descriptors: *Flood control, *Idaho, *Wild rivers, *Wild River Act, *Evaluation, Floods, Dams, Water storage, Costs, Benefits, Flood protection, Historic flood, Temperature, Watersheds (Basins), Rivers, Flood damage, Water management (Applied), Surface runoff, Snowmelt, Precipitation (Atmospheric), Maps, Projects, Hydrologic data, Discharge (Water).
Identifiers: *Salmon River (Ida).

This report lists major tributaries to the Salmon River and gives monthly and annual records of temperature, precipitation and discharge of the Salmon at various points. Apparently, no floods have been caused by rain runoff alone, but most are caused by a combination of heavy snow melt and rain runoff. The history of flooding in the Salmon basin is recounted and an appendix of 18 maps illustrates areas probably inundated during the Salmon's worst flood, which occurred in 1894. Costs of past floods are estimated and populations of small communities within the Salmon basin are given. Potential flood control storage sites are discussed, along with costs and benefits. Flood control benefits to the Salmon basin itself would be mostly negligable because of the limited amount of flooding, sparse population and small industrial and agricultural use of the area. However, flood control of the Salmon would benefit the lower Columbia River region. Many graphs and tables document this report. (See also W71-05702) (Yensen-Arizona)
W71-05703

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS; REPORT OF WATER FOR MUNICIPAL AND INDUSTRIAL USE SUBPROJECT,
Idaho University, Moscow. Water Resources Research Inst.
Fred J. Watts.
Available from NTIS as PB-197 998, $3.00 in paper copy, $0.95 in microfiche. University of Idaho Water Resources Research Institute, Report, September 1970. 37 p, 1 fig, 19 tab, 4 ref. OWRR Project B-014-IDA (2).

Descriptors: *Wild River Act, *Wild rivers, *Municipal water, *Irrigation water, *Industrial water, Water resources, Water utilization, Planning, Forecasting, Water demand, Water policy, Water management (Applied), Water consumption (Excludes consumptive use), Water conservation, Rivers, Idaho, Data collections, Withdrawal, Hydrologic data, Watersheds (Basins), Water requirements.
Identifiers: *Salmon River (Ida).

Designation of the Middle Fork of the Salmon River as an instant wild river raised the question of whether or not the river could be maintained in a scenic and free-flowing state without endangering present and future water needs of communities, industries, and agriculture in Idaho. This report determines present water needs for municipal, rural, and industrial use in the state. For this purpose, Idaho is divided into seven regions. Panhandle, Clearwater, Salmon, Southwest Idaho, Upper Snake No. 1, and Upper Snake No. 2. Many tables list water withdrawal needs for these regions. From these data, and illustrated in other tables, projections of industrial and non-industrial water use for future years are made. The author concludes that the Wild Rivers designation for the Middle Fork of the Salmon River will have no effect upon present and future use of water in the Salmon River hydrological area nor upon needs of the entire state. (See also W71-05702) (Yensen-Arizona)
W71-05704

THE EXPANSION OF OUTDOOR RECREATION FACILITIES; TWO CASE STUDIES FINANCED UNDER THE LAND AND WATER CONSERVATION FUND ACT IN WASHINGTON STATE,
Washington Univ., Seattle.
Daniel Perry Beard.
M. A. Thesis, 1969. 94 p, 16 fig, 64 ref, 2 append. OWRR Project B-019-WASH (4).

Descriptors: *Recreation, *Local government, *Federal government, *Planning, *Water resource development, Economic evaluation, Costs, Time, Prices, Lakes, Land, Water law, Pollution, Financing, Population.
Identifiers: *Land and Water Conservation Fund Act, *Portage Island, *Lake Washington Beach, *Phasing.

This thesis investigates the efforts of federal, state and local governments in attempting to expand the outdoor recreation facilities within Washington State. Two recreation projects undertaken by local agencies and funded under the Land and Water Conservation Fund Act are studied. The City of Renton's Lake Washington Beach project and the Portage Island project undertaken by Whatcom County were the largest acquisition and development projects undertaken by local agencies. The historical background of the project and the actual process used to fund the project are examined with particular attention paid to the problems encountered during implementation. Particular attention is focused on the success of local planning, justification of site selection and the time required to complete applications and receive state and federal funds. On the basis of comparisons between the two projects the author recommends: (1) the time required for awarding of funds must be minimized; (2) phasing must be discontinued; (3) the time an application is valid must be limited; (4) a status report for all applications submitted should be implemented; and (5) a regional clearinghouse should be created to give local governments a source from

which to obtain information concerning all federal assistance programs. (Murphy-Rutgers)
W71-05721

CRITERIA AND METHODS FOR STATE WATER RESOURCE PLANNING,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
Thomas L. Dobbs, Paananen Orman, and Paul A. Rechard.
Available from NTIS as PB-198 031, $3.00 in paper copy, $0.95 in microfiche. Wyoming Water Resources Research Institute, Water Resources Series No 22, Jan, 1971. 68 p, 3 tab, 71 ref. OWRR Project A-001-Wyo (35).

Descriptors: *Planning, *Cost-Benefit Theory, Indirect benefits, Discount rate, Simulation analysis, Water resources, Development, *Evaluation.

Criteria that might be used for evaluating alternatives in Wyoming water planning programs are discussed in this report. Theoretical aspects of planning criteria are presented and considerable attention is devoted to questions relating to efficiency criteria. Criteria relating to goals other than the efficiency goal are discussed to a limited extent, and conceptual aspects of multiple goal planning are treated briefly. Quantitative methods for analyzing water projects and plans on the basis of various criteria are discussed, with emphasis given to the simulation technique.
W71-05769

SOME PROBLEMS IN ESTABLISHING A NATIONAL WATER POLICY; STATEMENT PROPOSED FOR THE NATIONAL WATER COMMISSION, NOV. 5, 1970,
Washington Univ., St. Louis, Mo.
Charles L. Leven.
Institute for Urban and Regional Studies, Working Paper Ins 8, Washington University, St. Louis, Missouri, December 1970. 27 p, 1 chart.

Descriptors: *Water policy, *Planning, *Decision making, Resource development, Multiple purpose, Optimum development plans, Analytic techniques, *Cost-benefit analysis.
Identifiers: Environmental policy, Comprehensive planning.

In carrying out its water resource development policies, the federal government imposes three kinds of impacts on the nation and its regions: construction, services, and development. The construction impact deals with the impact of using resources to build water resource projects, both the service and development impacts refer to the impact on the economy of project facilities and the services coming from them. In discussing the economic considerations of the long-run development impact of national water policy, there are four specific areas examined. (1) Estimatimation of future 'needs'--present planning techniques are inadequate because of difficulty in establishing a unit value for benefits, setting interest rates, and estimating costs. (2) Benefit estimation for a single region--occassionally local decisions may not be consistent with national criteria or they fail to recognize interregional interaction. (3) Measuring economic benefits to the nation--problems of noncomparability of multiple effects are difficult to overcome. (4) Recommendations for establishing a National Water Policy--policy ought to be concerned with tapping the environment in order to meet preconceived needs of the population, and in restructuring the environment in ways which change the terms on which water and other services as well will be available in the future and how such availability will influence the total economic adjustment process. (Wray-Chicago)
W71-05773

WATER RESOURCES REGIONS AND SUBREGIONS FOR THE NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES.
Water Resources Council, Washington, D.C.

July 1970. 187 p.

Descriptors: *Management, *Water policy, *Administration, Analytical techniques, *Regions, *Land use, *Land resources, Water utilization.
Identifiers: *National assessment, Subregion delineation.

The Water Resources Planning Act (P.L. 89-80) directs the Water Resources Council to study and assess the adequacy of water supplies necessary to meet the water requirements in each water resource region in the United States, and also to study the relation of regional or river basin plans and programs to the requirements of larger regions of the Nation. This first National Assessment of Water and Related Land Resources was issued in 1968. One of the initial tasks involved in preparing for the next assessment is the delineation of geographic areas suitable for analysis. Guidelines for subregion delineation include: (1) areas drained by a river system; (2) a geographic area with common water management problems; (3) metropolitan regions; and (4) county lines. To facilitate compilations of data each county is identified as to its location within Economic Areas, Land Resource Areas, and Standard Metropolitan Statistical Areas. Every county is listed in its appropriate region and area. Maps outlining each of these geographic areas, as well as the water resource regions, subregions , and subareas are included. (Wray-Chicago)
W71-05775

ACCESS--ITS EFFECT ON AREA GROWTH AND ENVIRONMENTAL QUALITY.
Washington State Water Research Center, Pullman.

Conference held at Central Washington State College, Resource Planning Center, Ellensburg, Washington, May 15, 1970. 76 p. OWRR Project A-999-WASH (3).

Descriptors: Environment, *Environmental effects, *Urbanization, *Planning, Decision-making, *Social aspects, Social change, *Evaluation, *Regions, Ecology, Conservation, Natural resources, Water resources development, *Population.
Identifiers: *Environmental quality.

This was the second conference of the Resource Planning Center on economic growth and environmental quality. The following papers were presented: Growth Pressures and Response to Access Change, by Jerome Pickard; Quality and Human Dimensions of the Environment, by Gordon Hall; Access to Water, by Charles Roe; Access to Private Development, by Jerry Rogers; and Access to National Parks, National Forest, Wild Rivers, and Wilderness Areas, by William Worf. (See also W71-05777 thru W71-05781)
W71-05776

GROWTH PRESSURES AND RESPONSE TO ACCESS CHANGE,
Department of Housing and Urban Development, Washington, D.C.
Jerome Pickard.
In: 'Access- Its Effect on Area Growth and Enivronmental Quality' Central Washington State College, Ellensburg, Washington, May 15, 1970, p 3-17. 2 chart, 3 map. OWRR Project A-999-WASH (3).

Descriptors: *Planning, Decision-making, Social aspects, Social change, Urbanization Population, Optimum development plans.
Identifiers: *Comprehensive planning, Regional development, Metropolitan areas, Environmental quality, Urban environment, Water resources planning.

What we see in the physical, social, and economi development of our society is essentially the resu of a sequence of evolution of human societies, fro simple society in which most of the economic a tivity was devoted to subsistence livelihood an then evolved into a mercantile type of society in th Middle Ages. This mercantile society progressed accelerating rate from the middle of the eighteen century into the industrial age which produced a entirely new dimension. Urban regions appeare with the industrial age. In the twentieth centur the megapolis is developing. The problems society and the environment presented by thi growth are now being studied and discussed; the is a danger of having a premature determination what to do about a complicated problem. Planni for the future should coordinate all of the process that affect planning: water resources, location transportation facilities, and the types of thos facilities and where people live and work. (See als W71-05776) (Wray-Chicago)
W71-05777

QUALITY AND HUMAN DIMENSIONS OF TH ENVIRONMENT,
Hall and Goodhue, Monterey, Calif.
Gordon Hall.
In: 'Access--Its Effect on Area Growth and En vironmental Quality,' Central Washington Stat College, Ellensburg, Washington, May 15, 1970, 20-33. OWRR Project A-999-WASH (3).

Descriptors: *Environment, Planning, Natura resources, Conservation.
Identifiers: *Environmental quality, Environmenta problems.

Beautifying America is not a process; America i beautiful naturally. Before industrialization, ma seems to have lived more in tune with nature. Now the public will have to start demanding the preser vation of nature's beauty. For example, highway have often led to blighting screens which prevent u from seeing the countryside. Roads should be buil to emphasize natural beauty in addition to building with efficiency--and blight should be prohibited Zoning is one way of limiting blight along highways but pressure will have to begin from the public which shows its concern for the preservation of the environment. (See also W71-05776) (Wray Chicago)
W71-05778

ACCESS TO PRIVATE DEVELOPMENT,
Dillingham Land Corp., Los Angeles, Calif.
Jerry Rogers.
In: 'Access--Its Effect on Area Growth and En vironmental Quality,' Central Washington State College, Ellensburg, Washington, May 15, 1970, p 49-65. OWRR Project A-999-WASH (3).

Descriptors: *Urbanization, *Community develop ment, City planning, Social change, Population, Planning.
Identifiers: *Urban environment, Metropolitan areas, Social system.

In many American cities, the importance of the railroad has diminished and along with it the real estate development that was originally on those routes. Since the 1930's the highway has been a predominant factor in access, which in turn influence real estate development. The land developer is totally dependent on access routes for his activity because land that is not accessible has very little value. Generally, access has been provided largely by the public agencies which dictate the standards. The ability to absorb access costs into private land development is limited, and the financing methods prohibit long range planning by the developer. In larger development (several thousand acres) the developer has been able to influence access routes to some extent, but costs involved have not made it profitable. The government and private developers are now becoming concerned about developing more economic housing. Because sprawling urban areas have not eased

housing problems, developers are now looking back into high density areas. They are also interested in high density buildings in recreation areas instead of subdividing mountain land to provide low-density lots for only a few people. (See also W71-05776) (Wray-Chicago)
W71-05780

ACCESS TO NATIONAL PARKS, FORESTS, WILD RIVERS, AND WILDERNESS AREAS,
Forest Service (USDA), Missoula, Mont. Div. of Recreation and Lands.
William Worf.
In: 'Access--Its Effect on Area Growth and Environmental Quality,' Central Washington State College, Ellensburg, Washington, May 15, 1970, p 58-75. OWRR Project A-999-WASH (3).

Descriptors: *Resource allocation, Environment, Ecology, Natural resources, Conservation, Multiple purpose.
Identifiers: *Public policy, Open space, Environmental policy, Environmental problems.

The federal government has drastically changed its policy in the last 100 years from one of land disposal to land acquisition. The National Forest covers about ten percent of the United States, and according to present land use policy, will not be urbanized or developed for private residences. Controversy in the Forest Service recently has involved (1) questions of access, especially for recreational purposes; (2) areas designated as Wilderness which conflict with highway planning; and (3) problems from the use of off-road motorized vehicles. Companies with mining rights in Wilderness areas have had to work with the Forest Service in developing access routes. The National Park Service is considering the use of pod conveyors as an alternative to the automobile in order to reduce noise and air pollution. Multiple use decisions setting long-range management objectives for National Forest lands can have considerable impact on the economies, the development, and the population trends on the areas around the National Forests. (See also W71-05776) (Wray-Chicago)
W71-05781

RESEARCH INTERRELATIONSHIPS OF THE NATIONAL WATER COMMISSION, WATER RESOURCE COUNCIL, AND THE COMMITTEE ON WATER RESOURCES RESEARCH,
Federal Council for Science and Techology, Washington, D.C. Committee on Water Resources Research.
Warren A. Hall.
In: Report on 5th Annual Water Resources Research Conference, Washington, DC, Sponsored by the Office of Water Resources Research, Dept. of the Interior, Feb 3-4, 1970, p 7-20. 3 fig.

Descriptors: *Inter-agency cooperation, *Water policy, Federal government, Decision-making, Future planning.
Identifiers: Resource policy, Comprehensive planning, Water supply systems.

Interrelationships of the National Water Commission, Water Resources Council, and Committee on Water Resources Research is discussed. The goals of agencies of water resources arise from the constituents, and those goals are more easily achieved when agencies cooperate. In considering the future, predictions of a doubling in US population from 1965-2000 indicate the water supply systems will be unable to match the population growth from planning to actual water service takes 20-25 years, and planning is not presently being done for 2000. Previously, when the National Water Commission recommended a water supply plan, there were alternative water supplies to be considered; with increased population the alternatives will diminish and conflicts will increase. The Federal water program will have to conduct problem-orientated research to meet expanded water service needs. Because of limited research funds, there is a need of selecting the most important and visible alternatives upon which the research is to be established; because of limited time good research on all alternatives is necessary to speed up the 'political hassle.' Crash programs are always more costly, and to eliminate the waste of crash programs, water resource planners must begin working immediately to meet the needs of expanded population. (Wray-Chicago)
W71-05783

A FRAMEWORK FOR URBAN WATER RESOURCES RESEARCH,
American Society of Civil Engineering, Cambridge, Mass.
M. B. McPherson.
In: Report on the 5th Annual Water Resources Research Conference, Sponsored by the Office of Water Resources Research, Dept. of the Interior, Washington, DC, Feb 3-4, 1970, p 143-148. 1 fig. 8 ref.

Descriptors: *Water policy, Future planning, Urbanization, Municipal water.
Identifiers: *Metropolitan areas, Water supply systems, Comprehensive, Water resources planning.

The evolution of the United States from an argarian to an urban society has seemingly outpaced the capacity for adjustment of our prevailing institutions of government. The greatest task of local governments in the future will be in providing new services. To meet needs of water services in urban American, government and academic cooperation is urged in research, and centralized direction in operation. Recent studies of research needs on urban water resource have found a preponderance of critical needs at the interfaces, likages and interrelationships with all other urban system elements. Research needs focus on providing the bases for devising new policies, creating new programs and establishing new institutions. The broad objective of all research should be to clarify the interactions that take place through linkages of 5 major areas (cf.figU). The immediate objective of individual research would be reinforcement of knowledge on one of the major categories. In the past, water resource development has been essentially land-orientated; future planning must be people-orientated. Scientists must be consequence-conscious in water resource planning and attempt to make their technological data understandable to citizens who make judgements. (Wray-Chicago)
W71-05784

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS OF PERCUSSION VERSUS AIR ROTARY DRILLING,
Mission Mfg. Co., Houston, Tex.
For primary bibliographic entry see Field 08A.
W71-05687

6D. Water Demand

FUTURE WATER DEMANDS - THE IMPACTS OF TECHNOLOGICAL CHANGE, PUBLIC POLICIES, AND CHANGING MARKET CONDITIONS ON THE WATER USE PATTERNS OF SELECTED SECTORS OF THE UNITED STATES ECONOMY: 1970-1990,
Resources for the Future, Inc., Washington, D.C.
Charles W. Howe, Clifford S. Russell, Robert A. Young, and William J. Vaughan.
Available from NTIS as PB-197 877, $3.00 in paper copy, $0.95 in microfiche. Report National Water Commission NWC-EES-71-001, March 1971. NWC-EES-71-001. 114 p.

Descriptors: *Water demand, *Economic prediction, *Municipal water, *Industrial water, *Irrigation water, Technology, Political aspects, Water distribution (Applied), Distribution systems, Water pollution sources, Domestic use, Thermal powerplants, Oil industry, Sugar beets, Arizona, California, Texas.

This report summarizes the findings of 3 studies on water demands: (1) urban, (2) industrial, and (3) agricultural; it analyzes the effects of likely market trends, public policies, and technological change on water use and water pollution. The 3 studies concentrate on representative establishments, but frequently generalize results. (1) The urban study focuses on residential demands, and gives aggregate extrapolations from 1970 to 1990; trends in commercial demands are also discussed. Economically feasible ways to reduce losses from municipal water systems are analyzed thoroughly. (2) Three industries were analyzed in detail: thermal electric power, beet sugar refining, and petroleum refining. In each industry the withdrawal, consumption, and wasteload patterns of a representative plant are studied as functions of water price, water quality standards or effluent charges, input qualities, and output mix; aggregate projections are given. (3) The agricultural study characterizes typical farms in 3 major irrigation areas: the Lower Colorado Basin, Central Arizona, and the hard soils section of the Texas High Plains. The responses of water use patterns to water pricing, farm programs, and technology are traced.
W71-05339

AN OPTIMUM WATER ALLOCATION MODEL BASED ON AN ANALYSIS FOR THE KISSIMMEE RIVER BASIN (PHASE 1)-PROGRESS REPORT.
Florida Univ., Gainesville. Dept. of Agricultural Economics; and Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 02E.
W71-05370

EFFECT OF WATER RESOURCES ON ECONOMIC GROWTH IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
Charles B. Garrison.
Available from NTIS as PB-197 886, $3.00 in paper copy, $0.95 in microfiche. Completion Report, January 1971. 49 p, 9 tab, 3 fig, append. OWRR Project A-015-TENN (1).

Descriptors: *Streamflow, Regression analysis, Population density, Spatial distribution, Groundwater, Cost-benefit analysis, Evaluation, Water quality.
Identifiers: Water resources investment, *Economic growth, *Water availability, Chi-square tests, Water-oriented manufacturing, Manufacturing employment, Recurrence interval, Nonparametric statistics.

This study is concerned with the microlocation effect of water availability on manufacturing activity within the 194 county Tennessee Valley Region. The objectives of the study are to determine whether a statistically significant relationship exists between water availability in the region and location of water-oriented manufacturing activity; to determine whether a critical or threshold level of water availability can be identified and to quantify the relationship between water availability and manufacturing activities. Measures of both water availability or streamflow, and water-intensive manufacturing employment are developed at the county and small region level. Streamflow or water availability is measured by the annual seven-day low flow with a recurrence interval of ten years. A positive relationship was found between water availability and employment in water-intensive activities. Chi-square tests of independence indicate concentration of at least 500 employees are related to water availability. The tests indicate also a 7-day, 10-year minimum streamflow of 400 cfs is the threshold level of water availability for employment concentration. Additional locational factors were examined to explain the geographic distribu-

tion of employment concentrations. Regression analysis indicated a positive relation between population density and water-intensive employment. An estimate of the change in water-intensive employment by region was derived for the period 1959-1968. (Siegenthaler-Rutgers)
W71-05382

HYDROLOGICAL PROBLEMS RELATED TO THE USE OF SALINE WATERS,
Council of Scientific and Industrial Research, New Delhi (India).
For primary bibliographic entry see Field 03C.
W71-05465

AUSTRALIAN-AMERICAN INTERBASIN WATER TRANSFER,
Colorado Univ., Boulder. Dept. of Geography.
M. John Loeffler.
Annals, Association of American Geographers, Vol 60, No 3, p 493-516, September 1970. 14 fig, 4 tab, 14 ref.

Descriptors: *Inter-basin transfers, *Water resources development, *Hydroelectric power, *Arid lands, *Irrigation, Water users, Water utilization, Water policy (Allocation), Legal aspects, Social aspects, Economic feasibility, Political aspects, Federal government, Recreation demand, Human population, Water transfer, Water conservation, Colorado, Regional analysis, Colorado River.
Identifiers: *Australia.

The Australian interior and the American west are both arid, water-starved areas. The concept of interbasin water transfer is not new to either country, but the entry of federal government into water diversion is new to both. The Snowy Mountains Project of Australia, transferring water from the snowy to the Murray River and the Colorado-Big Thompson Project of the U.S., transferring water from the Colorado to the Big-Thompson River, are the first federally-built projects on either continent. As such, they are precedent-setting. There were arguments against both. Most of the Australian population lives near the ocean, giving rise to doubt about the wisdom of diverting water into the arid interior. The Colorado River, in turn, drains the most arid region of the U.S., and can little afford water loss through interbasin transfer. The 2 major reasons for the water diversions, hydroelectric power and irrigation, are thoroughly examined for both regions in terms of economic feasibility. Both factors are clouded by considerations not accounted for in the planning stages. There is some question of the importance of hydroelectric power production in the U.S. in terms of it's percentage of total power production. Also, the importance of irrigation projects for increasing farm production in an already saturated market is questionable. However, there are many benefits, such as increased recreational facilities. Both the merits and the obsolescence of these projects are discussed in detail. (Casey-Arizona)
W71-05477

ACCOMMODATING UNCERTAIN FORECASTS IN SELECTING PLANT DESIGN CAPACITY,
Gesellschaft fur Klaranlagen und Wasserversorgung, Mannheim (West Germany).
For primary bibliographic entry see Field 05F.
W71-05676

A SPATIAL ALLOCATION MODEL FOR PROJECTED OUTDOOR RECREATION DEMAND: A CASE STUDY OF THE CENTRAL UPSTATE NEW YORK REGION,
New York State Coll. of Agriculture, Ithaca, N.Y. Dept. of Agricultural Economics.
Mahfouz E. Tadros, and Robert J. Kalter.
SEARCH-Agriculture, Vol 1, No 5, Cornell University Agricultural Experiment Station, New York State College of Agriculture, Cornell University, Ithaca, New York, January 1971. 24 p, 30 tab, 2 maps, 21 ref.

Descriptors: *Linear programming, *Spatial distribution, *Optimization, *Computer programs, *Recreation demand, Time, Cost, Distance, Population, Swimming, Boating, Fishing, Camping, New York.
Identifiers: *Allocation model.

An allocation model designed to spatially distribute projected market demand for specified outdoor recreation activities was presented. After reviewing literature on various approaches to the spatial allocation problem such as regression equations, gravity models, and linear systems analysis, a linear programming model that simultaneously handles projected demand by occasion type, capacities of potentially visited recreation zones, and time, distance, and cost considerations was formulated. For the basic spatial allocation model, constraints were specified together with two objective functions; one to minimize total travel time, distance traveled, or cost involve by all visitors from all population zones and the other to maximize the number of visitors traveling to more attractive sites. The model was empirically evaluated via an application to 22 counties in central upstate New York, divided into 83 origin or population zones and 230 destination zones. The region was assumed to be closed area and the model was solved through use of the Fortran IV computer program, for four recreational activities: swimming, boating, fishing, and camping. Projected 1985 market demand was used as demand input for model solution. The solution appeared to give a general feeling for the magnitudes involved in recreational demand distribution. (Kriss-Cornell)
W71-05678

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS; REPORT OF WATER FOR MUNICIPAL AND INDUSTRIAL USE SUBPROJECT,
Idaho University, Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W71-05704

SELECTION OF THE OPTIMUM METHOD FOR ESTIMATING THE DEMAND FOR NON-MARKET WATER RESOURCES WITH INCOMPLETE INFORMATION,
Washington Univ., Seattle.
Gardner Brown, Jr.
University of Washington, Seattle, Washington, August 18, 1968. 6 p. OWRR Project A-015-WASH (1).

Descriptors: *Washington, *Sport fishing, *Estimating equations, *Economics, *Elasticity of demand, Salmon, Demand, Recreation, Fisheries, Anadromous fish, Model studies.
Identifiers: *Non-market water resources.

The Washington state sport salmon fishery was used as the working data source in this study, since it represents a valuable non-market water resource with incomplete information available for programming. An analysis of the economic demand for this fishery was undertaken, and an estimated demand equation was formulated, from which is can be suggested that, successfully managed, the non-commercial salmon fishery will continue to grow rapidly. Compared with a similar Oregon study, the income elasticity of demand was much higher, probably because of its basis upon time-series data rather than cross-section data. The model provides qualitative prediction value where quantitative data is not available. (Yensen-Arizona)
W71-05706

SIMULATION VIA TIME-PARTITIONED LINEAR PROGRAMMING: A GROUND AND SURFACE WATER ALLOCATION MODEL FOR THE GALLATIN VALLEY OF MONTANA,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 02A.
W71-05716

6E. Water Law and Institutions

ALLEN V WOOD (TITLE TO ACCRETIONS T SEASHORE).

256 Mass 343, 152 NE 617-621 (1926).

Descriptors: *Massachusetts, *Accretion (Leg aspects), *Boundaries (Property), *Seashor Shores, Boundary disputes, Riparian land, Riparir waters, Land tenure, Roads, Beaches, Coast Legal aspects, Judicial decisions, Bays, Navigab waters, Oceans.

Plaintiff landowner sought to register title to accr tions to his beachfront property. Plaintiff's prope ty was bounded on the front by the high wat mark, on the back by a public street, and at one en by the intersection of the high water mark and th street. Plaintiff contended that, due to accretio his land extended to the intersection of th accreted land and a line extending beyond the ere of the public street. Defendant landowners co tended that plaintiff owned only up to the interse tion of the street and the high water mark as it e isted at the time of the conveyance. The Suprem Judicial Court of Massachusetts noted that accr tions to the shore ordinarily belong to the uplan owner and that the monument made by th described intersection could move as the hig water mark moved. However, the court held th plaintiff could not own beyond the end of the stre since there was no intersection of high water mar and street beyond that point and affirmed th judgment partitioning the remainder of the ne shoreline among the upland owners. (Liptak Florida)
W71-05367

IN RE WATER FRONT, CITY OF NEW YORK (VALUATION OF CONDEMNED WATER FRONT PROPERTY).
246 NY 1, 157 NE 911-922 (1927).

Descriptors: *New York, *Condemnation, *Con demnation value, *Land tenure, Judicial decision Legal aspects, State governments, Local gover ments, Legislation, Contracts, Coastal structure Landfills, Shores, Islands, Navigation, Harbor Bays, Navigable waters, Eminent domain, Real pro perty, Docks.

Plaintiff city condemned waterfront property of de fendant landowners along the eastern shore o Staten Island. Plaintiff and defendants both ap pealed the awards set in lower courts. Plaintif claimed that the defendants did not hold fee titles but merely the right to erect and use docks unde the original land grant from the state. The Court o Appeals of New York held fee title was the prope basis for assessing value. The land was grante under statutes allowing land commissioners to pro vide such title to lands under navigable waters. I the grantees did not perform conditions subsequen as to constructing docks, it was up to the state, no the city, to object. Defendants objected to a lowe appellate couion of the awards to the amount thei original predecessors-in-title paid for the land, plus costs of improvements. The court of appeals af firmed the reduction, however, noting that the grants under which their predecessor purchase stated that the city could acquire the property for the original cost plus the cost of improvements The clause ran with the title. (Morris-Florida)
W71-05372

AN ANALYSIS OF NEW JERSEY'S WATER POLLUTION CONTROL PROGRAM,
Rutgers-The State Univ., New Brunswick, N.J. Bureau of Government Research.
For primary bibliographic entry see Field 05G.
W71-05380

ROBINSON V FRED B HIGGINS CO (CON STRUCTION OF PIER REQUIRES PERMIS

ION OF UPLAND OWNER).
35 A 901-903 (Me 1927).

Descriptors: *Maine, *Riparian rights, *Piers, *Access routes, Shores, Riparian land, Riparian waters, Posts, Oceans, Docks, Coastal structures, Navigation, Boats, Ships, Right-of-way, Relative rights, Permits, Legislation, Usufructuary right, Structures, Legal aspects, Judicial decisions.

Plaintiff riparian owner sought to enjoin defendant lobster company from extending its wharf from its adjoining riparian land in front of plaintiff's land. Plaintiff contended that the wharf would cut off his riparian right of access to the ocean and that consent to such construction by the upland owner was required by statue. Defendant contended that it had acquired all the necessary licenses for the wharf and that plaintiff's denial of permission was unreasonable in light of the minimal obstruction of his access and the unsuitability of locating the wharf in front of defendant's upland. Affirming a decree in plaintiff's favor, the Supreme Judicial Court of Maine held that the statutes authorizing licenses for wharves did not diminish the upland owner's right to refuse permission. The court noted that the evidence supported a finding that plaintiff's access would be seriously restricted by the proposed wharf. (Liptak-Florida)
W71-05391

NEELD V DIXON (BOUNDARY OF RIPARIAN LAND WHERE SHORELINE DIFFERS FROM LEGAL DESCRIPTION).
10A
144 A 489-490 (Ct App Md 1929).

Descriptors: *Maryland, *Shores, *Boundaries (Property), *Riparian land, Bays, Accretion (Legal aspects), Boundary disputes, Land tenure, Real property, Surveys, Mapping, Legal aspects, Judicial decisions, Easements.

Plaintiff landowner brought action of ejectment against defendant landowner to recover that portion of a bayshore separating defendant's described boundary and the actual shoreline. Plaintiff contended that defendant's tract was bounded by the metes and bounds in his deed from their common grantor and claimed title to the land between defendant's described boundaries and the shoreline. Defendant argued that his deed conveyed all privileges in the bayshore and that the bayshore was originally within the described boundary lines. Affirming a judgment for defendant, the Court of Appeals of Maryland noted that the evidence showed that the shoreline was originally at least contiguous with, if not wholly within, the described boundary line. The court also noted that, even if part of the shore was outside of the described line, the reference to the shore in the defendant's deed should be considered as a call to the bayshore, which would take precedence over the description by metes and bounds. (Hart-Floirda)
W71-05393

ROSS V MAYOR AND COUNCIL OF BOROUGH OF EDGEWATER (MUNICIPAL JURISDICTION TO REQUIRE LICENSE TO STORE VESSELS ON NAVIGABLE RIVER).
80 A 866-874 (NJ 1935).

Descriptors: *New Jersey, *Cities, *Jurisdiction, *Legislation, High water mark, Low water mark, Riparian land, Riparian rights, Hudson River, Navigable rivers, Non-navigable waters, Boundary disputes, Boundaries (Property), Reservation doctrine, Docks, Piers, Accretion (Legal aspects), Legal aspects, Judicial decisions.

Plaintiff riparian landowner brought certiorari against defendant city to review defendant's ability to prosecute under an ordinance requiring a license to store vessels in the Hudson River. Plaintiff contended that defendant's jurisdiction did not extend to lands lying between high and low water mark. The Supreme Court of New Jersey noted that: (1) the boundary of a riparian owner on a non-navigable stream extends to the thread of the stream, but the boundary of a riparian owner on navigable waters extends only to high water mark; (2) lands below high water mark belong to the state; (3) the state's title is proprietary; (4) the state's dominion over navigable waters is subject to the Congressional power to regulate navigation; (5) under common law, a riparian owner could appropriate lands between high and low water mark for his own use; and (6) a riparian owner has the right of access to the shore. Determining that municipal jurisdiction extended to low water mark by virtue of defendant's appropriation of property below high water mark for its exclusive use, the court held that plaintiff was subject to prosecution for violation of the ordinance. (Hart-Florida)
W71-05395

FAULKS V BOROUGH OF ALLENHURST (INSTALLATION OF SEWAGE TREATMENT PLANT ON PUBLIC ROAD EASEMENT).
180 A 877-880 (NJ Ct Err and App 1935).

Descriptors: *New Jersey, *Sewage treatment, *Easements, *Roads, Cities, Chlorination, Septic tanks, Sewage disposal, Sewers, Condemnation, Eminent domain, Right-of-way, Compensation, Public health, Riparian land, Oceans, High water mark, Low water mark, Tides, Legal aspects, Judicial decisions.

Plaintiff riparian landowner brought ejectment against defendant city to force removal of a sewage tank and chlorination unit from her premises. Defendant had a public road easement along the edge of plaintiff's tract. At the end of the road, where it ran into the ocean, defendant built a sewage chamber and a chlorination house. Plaintiff contended that these structures surcharged defendant's easement. Defendant contended that the structures were between high and low water mark on accreted land which was state-owned and hence plaintiff had no interest in the site. The New Jersey Court of Errors and Appeals defined 'high water mark' as the line of medium high tide between the spring and neap tides. Reviewing the evidence, the court determined that the high water mark was between the structures and the ocean and held that they were hence situated on the public easement. Since defendant did not attempt to justify the installation as a lawful street use, the court held for plaintiff, noting that defendant might acquire the premises by condemnation and payment. (Hart-Florida)
W71-05403

PORK PRODUCERS AND POLLUTION: LEGAL ASPECTS,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 05G.
W71-05418

IN RE LANDS ON UPPER NEW YORK BAY (TITLE TO SUBMERGED LANDS GRANTED CITY BY CHARTER).

215 App Div 204, 213 NYS 486-500 (Sup Ct 1926).

Descriptors: *New York, *Land tenure, *Beds under water, *Cities, Ownership of beds, Beds, Real property, Roads, State governments, High water mark, Bays, Navigable waters, Legal aspects, Judicial decisions, Local governments, Highways.

Plaintiff municipality sought to acquire title to submerged lands in front of its streets. Defendant transit company claimed title to the lands through a conveyance from the state. Plaintiff claimed the lands by virtue of its charter provision passing title in fee to all submerged lands to plaintiff. Defendant's patent was ordered prior to the charter's effect, but was not issued until after plaintiff's charter was effective. Defendant contended that the charter could not pass title to land which the state did not own. The Supreme Court of New York stated that where a highway terminates at high water mark of navigable waters, submerged lands adjacent to the street are subject to an easement essential to the highway. But determining that another charter provision precluded plaintiff from impairing defendant's right to receive its patent, the court held title in defendant. Since the street intersected the shore, defendant's land was subjected to a public easement. The court furthermore noted that plaintiff's title was unaffected by a subsequent street closing, but was determined at the charter's effective data. (Hart-Florida)
W71-05460

CRABBE V MIDDLETOWN HYDRAULIC CO (PRESCRIPTIVE RIGHT TO USE APPROPRIATED WATER).
116 Ohio St 26, 155 NE 554-555 (1927).

Descriptors: *Ohio, *Prior appropriation, *Prescriptive rights, *Bayous, State government, Navigation, Appropriation, Preference (Water rights), Beneficial use, Surplus water, Judicial decisions, Legal aspects, Water rights, Contracts.

Plaintiff state brought quo warranto against defendant hydraulic company. Defendant's predecessors had appropriated bayou water for use as a millrace. Defendant's predecessor conveyed to plaintiff the right to a joint use with him of the water thus appropriated. Under the conveyance, plaintiff received the right to take all water required for navigation, without damage to the reservations in the conveyance. The state never used more than 8000 cubic feet per minute while defendant used between 18,000 and 22,000 cubic feet per minute. Plaintiff sought to compel defendant to reduce its use. The Supreme Court of Ohio held that by use of an amount in excess of plaintiff's use for some 50 years, defendant had acquired a prescriptive right, as against plaintiff, to continue to use the same amount of water. (Hart-Florida)
W71-05472

THE RIO LAUCA: DISPUTE OVER AN INTERNATIONAL RIVER,
Southern Connecticut State Coll. New Haven. Dept. of Geography.
Martin Ira Glassner.
Geographical Review, Vol 60, No 2, p 192-207, April 1970. 2 fig, 18 ref.

Descriptors: *Interstate rivers, *International law, *Water law, *International waters, *Water resources development, Arid lands, River basins, International commissions, Riparian rights, Political aspects, Social impact, History.
Identifiers: *Chile, *Bolivia, *Atacama Desert, *OAS, *Declaration of Montevideo.

The Atacama Desert of northern Chile is one of the driest regions of the earth. The Rio Lauca arises east of the Atacama on the high, semiarid Altiplano, runs 75 km. through Chile and 150 km. through Bolicia, following a shallow gradient, and empties into the Lago de Coipasa, in Bolivia. In 1939, Chile announced plans to divert part of the waters and irrigate the Azapa Valley, in order to provide a stable food supply for the city of Arica. This led to a series of intermittent and increasingly bitter exchanges between the 2 countries, through 1964. In efforts to resolve the problem, 2 different joint commissions investigated the project and an appeal was made to the OAS in 1962. Bolivia views the scheme as a serious transgression of it's rights as a lower riparian state and as another incident in a long history of economic, political and military aggression by Chile. In further claims that the project, by tampering with her 'patrimony', will adversely affect the climate of the Lauca Basin and increase salinization of the Lago de Coipasa. The country has also tied the issue to its long quest for an outlet to the sea (salida al mar). Chile simply views the scheme as an internal development pro-

gram vital to her arid region and is willing to compensate the few Bolivians who will suffer, in order to improve food supplies for 100,000 people. Bolivia has been able to produce no evidence for the claimed damage. Diversion began in 1962. Both countries accept the Declaration of Montevideo, but differ in their interpretation of it's applicability. The author feels that this problem may be solved by regional cooperation, but a great difficulty in cases of this sort, is the lack of a coherent body of international law. (Casey-Arizona)
W71-05485

FLORIDA WATER-RIGHTS LAW,
J. C. Adkins, Jr.
In: Florida Real Estate Law and Procedure, Harrison Company, Atlanta, p 1629-1653, 1960. 25 p, 64 ref.

Descriptors: *Florida, *Water law, *Riparian rights, *Water rights, Legislation, Lakes, Ponds, Natural flow doctrine, Alteration of flow, Civil law, Competing uses, Domestic water, Natural use, Reasonable use, Relative rights, Stock water, Surface waters, Conjunctive use, Drainage, Repulsion (Legal aspects), Riddance (Legal aspects), Surface runoff, Judicial decisions, Non-navigable waters, Subsurface waters.

In this chapter from a treatise on Florida real estate law, the law of water rights in Florida is divided into six sections: (1) Florida water resources law; (2) reasonable use theory; (3) non-navigable lakes; (4) surface waters and watercourses; (5) subsurface or percolating waters; and (6) lakes and ponds. Both case law and legislation relating to water rights is examined. It is stated that the rights of riparian proprietors to use waters of a non-navigable lake in Florida are equal. However, this principle is qualified by a statement that any use must be lawful and not detrimental to rights of other riparian owners. In addition, it is noted that non-navigable lakes may be privately owned. Surface water is described as water derived from precipitation, or rising to the surface from springs. The two rules governing use of surface--the civil and common law rules--are examined. In the discussion of subsurface waters, the author observes that Florida has rejected the common law rule of unrestricted right to draw percolating water from private land. Law pertaining to lakes and ponds is briefly discussed. (See also W71-05487) (Hart-Florida)
W71-05486

FISH (OWNERSHIP; PRIVATE AND PUBLIC RIGHTS),
J. C. Adkins, Jr.
In: Florida Real Estate Law and Procedure, Harrison Company, Atlanta, p 1656-1658, 1960. 3 p, 6 ref.

Descriptors: *Fish, *Florida, *Reservation doctrine, *Public rights, State governments, Legal aspects, Water law, Riparian land, Land tenure, Real property, Access routes, Fishing, Navigation, Civil law.
Identifiers: *Trust doctrine.

This section from a treatise on Florida real estate law, after noting that under Spanish civil law fish were held in trust for the public, observes that the trust principle carried over when Florida was ceded to the United States. This trust doctrine is subject to the federal power over navigation and interstate commerce. It is also noted that the public's ownership of fish is subject to state regulation for the general welfare. Fish are legally classified as ferae naturae; hence their ownership is in the state, not as a proprietor, but in a sovereign capacity as trustee for the people. However, once fish are reduced to possession, they may be properly claimed by particular individuals. Although there is a right to fish in public waters, there is no right to approach public water through private property, or to fish from private property without the owner's consent. (Hart-Florida)
W71-05487

EXECUTIVE ORDER 11548 (DELEGATED FUNCTIONS OF THE PRESIDENT UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).

Federal Register, Vol 35, p 11677-11679, July 1970. 3 p.

Descriptors: *Pollution abatement, *Administrative agencies, *Water pollution control, *Supervisory control (Power), Federal government, Administration, Regulations, Administrative decisions, Jurisdiction, Coordination, Decision making, Leadership, Pollutant identification, Water pollution sources, Ships, Water pollution treatment, Oil, Oily water, Oil wastes, Navigation, Navigable waters, Inter-agency cooperation, Coast Guard regulations, Legal aspects, Institutional constraints.
Identifiers: *Water Pollution Control Act, *Water Quality Improvement Act.

By virtue of the authority vested in him by the Federal Water Pollution Control Act, the President of the United States, in this executive order, delegates authority to various executive departments and agencies. The Secretary of the Interior is authorized to : (1) investigate the control of pesticide release; (2) determine, in consultation with the Secretary of Transportation, the quantities of oil discharge harmful to the public health; (3) identify dispersants and chemicals; (4) determine substantial threats from, the abatement remedies for, oil discharges; (5) carry out provisions preventing oil discharge from non-transportation-related onshore and offshore facilities; and (6) designate hazardous substances, other than oil, presenting dangers to the public health or welfare when discharged onto navigable waters or adjoining shorelines. The Secretary of Transportation is delegated authority to inspect oil-carrying vessels and under proper circumstances, to board such vessels and execute arrest and other warrants. Responsibility for the issuance of regulations governing financial responsibility for oil carrying vessels is vested in the Federal Maritime Commission. Authority for the preparation and publication of oil removal contingency plans is given to the Council on Environmental Quality. The Coast Guard is designated as the agency empowered to receive notices of oil discharge. (Earl-Florida)
W71-05488

NOTICE OF PUBLIC HEARING ON AMENDMENTS TO COMPREHENSIVE PLAN.
Delaware River Basin Commission, Trenton, N. J.

Federal Register, Vol 35, p 11429, July 1970. 1 p.

Descriptors: *Water resources development, *Interstate commissions, *Delaware River Basin Commission, *River basins, Decision making, Public rights, Watershed management, Wells, Sewage treatment, Adoption of practices, Project planning, Atlantic Coastal plain, Northeast U.S., Regions, Administration, Interstate rivers, Institutional constraints, Political aspects, Political constraints, Water allocation (Policy), Water supply, Water policy.

In this notice of public hearings to amend the Delaware River Basin Commission's Comprehensive Plan, seven additional water resource projects are proposed. Replacement wells, filtration facilities, projects to increase permissible levels of well withdrawl, new well-water supply systems, and sewage treatment plants are included within the proposals. (Earl-Florida)
W71-05489

DELEGATION OF RESPONSIBILITY TO CARRY OUT CERTAIN PROVISIONS OF FEDERAL WATER POLLUTION CONTROL ACT.
Executive Office of the President, Washington, D. C.

Federal Register, Vol 35, p 8631, June 1970. 1 p.

Descriptors: *Jurisdiction, *Administrative ag
cies, *Ships, *Supervisory control (Pow
Federal government, Administrative decisions,
ministration, Leadership, Decision making, W
pollution control, Water pollution sources,
Navigable waters, Regulations, Coordinat
Legislation, Cost repayment, Compensation.
Identifiers: *Federal Water Pollution Control AA

In this Presidential letter to the chairman of
Federal Maritime Commission, the Commissio
vested with responsibility for implementing th
provisions of the Federal Water Pollution Con
Act relating to the financial responsibility of
carrying vessels. (Earl-Florida)
W71-05490

**NATIONAL OIL AND HAZARDOUS MATER
ALS POLLUTION CONTINGENCY PLAN.**
Environmental Quality Council, Washington, D.

Federal Register, Vol 35, p 8508-8514, June 19
7 p.

Descriptors: *Federal government, *Water po
tion control, *Integrated control measures, *
Administration, Adoption of practices, Oil was
Multiple-purpose projects, Programs, Coordi
tion, Administrative agencies, Long-term planni
Future planning (Projected), Planning, Regulati
Jurisdiction, Inter-agency cooperation, Instit
tional constraints, United States, Pollution aba
ment, Oil water, Water pollution, Warning syste
Non-structural alternatives, Decision making.
Identifiers: *Water Quality Improvement Act
1970.

Set forth in this contingency plan is a mechani
for coordinating the response to spills of oil
other hazardous material. Effective June 1970,
National Multiagency Oil and Hazardous Materi
Contingency Plan is superseded by this promul
tion, developed by the Council on Environmen
Quality pursuant to the Water Quality Impro
ment Act of 1970. The Plan consists of six sectio
The background, purpose, objectives, and scope
the Plan are presented in section one. Federal p
icy and federal and non-federal responsibilities a
set forth in section two. The planning and respon
elements, detailed in section three, consist of th
(1) National Interagency Committee, (2) Natio
Response Center, (3) National Response Tea
(4) Regional Response Center, (5) Regio
Response Team, and (6) on-scene coordinati
Federal response operations, response phases, a
water-pollution-control procedures are set forth
section four. Coordinating instructions, contain
in section five, deal with such areas as : (1) deleg
tion of authority, (2) multiregional actions, (
notification, and (4) patterns of response actio
The amendment authority of federal agencies is s
forth in section six. Thirteen annexes, dealing wi
technical aspects of the plan, are also includ
(Earl-Florida)
W71-05491

**SHORE EROSION CONTROL (EROSION CO
TROL DISTRICTS AND CONSTRUCTIO
LOANS).**

Md Code Ann art 66C, secs 756 thru 758C (Sup
1970).

Descriptors: *Maryland, *Erosion control, *Sho
protection, *Loans, Legislation, Control stru
tures, Bank protection, Erosion, Bank erosio
Beach erosion, Sedimentation, Silting, Administr
tion, Construction, Construction costs, Administr
tive Costs, Government supports, Governme
finance, Financing, Sea walls, Shores, Bulkhead
Riparian land, Assessments, Cost repayment.
Identifiers: *Shore erosion control districts.

To protect and preserve the shorelines of Mar
land, the State Department of Natural Resources
authorized to develop a program of shore erosi
control. The Department may initiate programs

ducate the public concerning erosion, review petitions for formation of shore erosion control districts, assist property owners in designing and constructing erosion control projects, and administer e erosion control loan fund. Any owner of property abutting state waters may apply for assistance a shore erosion control project. Projects shall be signed priority based on the rate of erosion, mount of resulting silt, and probable public enefits of the project. Upon the Department's ecommendation, the Board of Public Works may stablish a shore erosion control district, and all roperty owners in the district must participate in a roject. Technical assistance and advice to proper- owners will be paid by the state. A construction an fund is created to provide interest-free loans o those seeking to build erosion control projects. he loans shall be repaid by special tax assessments f the benefited property. The maintenance of ompleted projects shall be the sole responsibility f the property owners. (Liptak-Florida)
W71-05492

EVERN RIVER WATERSHED--SEDIMENT ND WASTE CONTROL.

Md Code Ann art 66C, secs 411AE thru 411AO Supp 1970).

Descriptors: *Maryland, *Sediments, *Waste isposal, *Water pollution control, Legislation, Rivers, Water pollution, Pollution abatement, Water quality control, Standards, Regulation, Wastes, Effluents, Sewage effluents, Watershed anagement, Sewage disposal, Silts, Conservation, Natural resources, Permits, Construction, Environmental effects, Governments, Administration, Administrative agencies.

All agencies or persons planning new sewage treatment or disposal facilities in the Severn River watershed must meet the water quality standards set by the State Department of Water Resources, State Department of Health, and county health departments. All owners and operators of existing disposal plants not meeting the above standards shall submit an improvement plan to the Health Department, and the plan shall provide that all improvements be completed within three years. If any owner or operator fails to submit a plan or to construct the necessary improvements, the county or city may make the improvements and may hold the owner and operator liable for the costs. The county health department shall take monthly water samples of all sewage discharges and send copies of the analysis to the State Department of Health, and discharge of raw sewage or other waste in the river is prohibited. Any grading, excavating, or filling must first be approved by the soil conservation district, and regardless of any zoning or planning controls, the county or city may not issue permits for construction without such approval and other assurances that the construction will not contribute to the pollution or silting of the river. (Liptak-Florida)
W71-05493

TOWNSHIP'S AUTHORITY TO REQUIRE CONNECTIONS INTO ABUTTING WATER SUPPLY SYSTEMS.
Purdon's Penn Legislative Service, Act No 97 (1970).

Descriptors: *Pennsylvania, *Water supply, *Municipal water, *Cities, Local governments, Water delivery, Distribution systems, Water conveyance, Water districts, Water works, Domestic water, Stock water, Industrial water, State governments, Real property, Land tenure, Cost repayment, Construction costs, Reimbursable costs, Payment, Administration, Legislation, Legal aspects, Remedies.

Townships may require property owners to connect with water supply systems abutting their property. Upon the refusal of a property owner to make such connections, townships are empowered to enter and construct such connections. In case of default in the monthly installment payments imposed for such connection by the township, the entry of a municipal lien against the abutting property is authorized. Industries and farms having their own water supply systems for uses other than human consumption are excepted. (Earl-Florida)
W71-05494

MUNICIPALITIES--SEWAGE DISPOSAL SYSTEMS--FINANCE, CONSTRUCTION AND OPERATION.
NJ Session Law Service Ch 209 (1970).

Descriptors: *New Jersey, *Sewage districts, *Local governments, *Coordination, Legislation, State governments, Institutional constraints, Inter-agency cooperation, Public utility districts, Administration, Administrative agencies, Adoption of practices, Sewage treatment, Sewage, Cities, Legal aspects, Political aspects.

Municipalities and counties, with the consent and approval of sewerage and municipal utilities created by them, are authorized by this legislation to engage in cooperative efforts to construct and extend facilities for the collection, treatment, and disposal of sewage. Such cooperative efforts undertaken before this enactment are validated, ratified, and confirmed. (Earl-Florida)
W71-05495

INTERSTATE SANITATION COMMISSION--TRI-STATE COMPACT--WATER QUALITY STANDARDS.
NJ Session Law Service Ch 212 (1970).

Descriptors: *New Jersey, *Interstate compacts, *Interstate commissions, *Water quality control, Legislation, Water pollution control, Non-structural alternatives, Administration, Administrative agencies, Standards, Regulation, Coordination, Interstate, Political aspects, Classification, Water analysis, Water quality, Effluents, Administrative decisions, State governments, Legal aspects.

The Interstate Sanitation Commission, by virtue of this legislation, is empowered to develop and place in force water classification and effluent standards within the Commission's tri-state jurisdiction. Such standards are required to be based on present or intended uses of the water in question and accompanied by regulations governing the quality of the effluents and receiving waters. Classifications made pursuant to this legislation must meet the water and related land resource plans and pollution-control plans of the signatory states. Such classifications must also comply with the procedural requirements of federal law. (Earl-Florida)
W71-05496

FISH--BAIT AND LURE (RESTRICTIONS ON THE POSSESSION OF CERTAIN FISHING LURES).
New Jersey Session Law Service Ch 150 (1970).

Descriptors: *New Jersey, *Baits, *Fishing, *Fishing gear, Fish conservation, Bait fishing, Fly fishing, Cold-water fishing, Sport fishing, Regulations, Legal aspects, Legislation, Fish management, Fish attractants.

No person while angling in designated waters may possess any natural bait or artificial fishing lures other than those specified as legal. Violation is punishable by fine. (Earl-Florida)
W71-05497

TOWN OF PALM BEACH V CITY OF WEST PALM BEACH (CITY'S POWER TO CONDEMN OTHER CITY'S PROPERTY FOR SEWAGE DISPOSAL PURPOSES).
239 So2d 835-840 (4th DCA Fla 1970).

Descriptors: *Florida, *Eminent domain, *Sewers, *Cities, Sewage disposal, Sewage, Outlets, Pipes, Pipelines, Condemnation, Sewage treatment, Governments, Conveyance structures, Outlet works, Oceans, Public health, Water pollution, Public utilities, Treatment facilities, Gases, Legal aspects, Right-of-way.

Plaintiff city brought action to condemn defendant town's property for the construction of a pipeline and ocean outfall. The pipeline and outfall were to be a part of plaintiff's sewage disposal system. Plaintiff also sought land for a gas-removal vault to extract gas from the pipeline, thus preventing possible airlocks. Defendant's town objected and contended that the city had no authority to acquire property within another municipality by eminent domain, that land for the gas-removal vault could not be acquired without defendant's consent, and that the construction of the ocean outfall was against public policy. Denying the town's petition for certiorari, the Fourth District Court of Appeal of Florida noted that statutes clearly gave the city power to condemn property within another municipality for sewage transmission lines. Moreover, the gas vault was such an integral part of the transmission system as to be within plaintiff's eminent domain power. The court also held that even though ocean outfalls are subject to regulation by the state and must meet stringent public health requirements, they are not against public policy per se; they are thus within a city's eminent domain power. (Liptak-Florida)
W71-05498

FARR V LEACH (REMEDY FOR REFUSAL TO CONSTRUCT DIVERSION DITCH ORDERED BY COUNCIL).
134 A 594-595 (Vt 1926).

Descriptors: *Vermont, *Remedies, *Legislation, *Floods, Cities, Streams, Flood protection, Flood routing, Floodwater, Overland flow, Rain, Storm runoff, Water injury, Ditches, Bypasses, Diversion structures, Drainage engineering, Water conveyance, Compensation, Payment, Cost repayment, Adjudication procedure, Judicial decisions, Legal aspects, Administrative agencies.

Plaintiff lower landowner sued defendant upper landowner in tort. Plaintiff's meadow was frequently flooded by a brook flowing over defendant's higher land. Defendant refused to cooperate with plaintiff to divert the brook, so plaintiff petitioned the municipal council under a statute authorizing the council to order diversion and apportion the cost between upper and lower owners. Another statute provided that if a party so ordered did not accomplish diversion, another party of record might enter upon the land of the first to construct a ditch to divert the water and demand payment therefor. The council ordered the plaintiff and defendant to construct portions of a ditch to divert the water. Defendant refused to construct his portion, whereupon plaintiff brought this action in tort for damages caused by defendant's refusal. Noting that plaintiff's complaint did not allege that his portion had been constructed, the Supreme Court of Vermont held that the statute provided the exclusive remedy for defendant's refusal and that, therefore, a tort action would not lie. Plaintiff's only remedy was to bring an action for payment after constructing defendant's portion of the ditch. (Hart-Florida)
W71-05504

GORDON V PETTEY (DAMAGES AND INJUNCTION FOR LANDSLIDES CAUSED BY LANDFILL ON UPPER SLOPE).
291 Pa 258, 139 A 914-916 (1927).

Descriptors: *Pennsylvania, *Remedies, *Landfills, *Landslides, Debris avalanches, Retaining walls, Soils, Drains, Stratigraphy, Judicial decisions, Legal aspects, Rain water, Rainfall, Percolating water.

Plaintiff lower landowner brought action for damages caused by defendant upland owner's land-

fill and sought an injunction to compel defendant to remove the fill. Defendant filled in his land without providing retaining walls or drains, causing a landslide which damaged plaintiff's property. The trial court found that the fill caused the slide by its pressure upon the underlying strata. Defendant contended that the slide was caused by rain water which percolated through and undermined the soil. Since plaintiff had specifically advised defendant of the danger, the Supreme Court of Pennsylvania held defendant liable. However, since plaintiff had not shown that further slides were likely, the court determined that an injunction compelling defendant to remove the fill or provide drains and retaining walls was improper in light of the inordinate expense which would be entailed by defendant's compliance. (Hart-Florida)
W71-05511

THE CANADIAN ARCTIC WATERS POLLUTION PREVENTION ACT: NEW STRESSES ON THE LAW OF THE SEA,
Wisconsin Univ., Madison. School of Law.
Richard B. Bilder.
Michigan Law Review, Vol 69, No 1, November 1970. 54 p.

Descriptors: *Pollution abatement, *Arctic Ocean, *Law of the sea, Legislation, Jurisdiction, Boundaries, International law, Water pollution control.
Identifiers: *Canada, *The Canadian Arctic Waters Pollution Prevention Act, Shipping zones, Fishing zones.

The Canadian Arctic Waters Pollution Prevention Act was approved June 17, 1970. This act assures Canada's jurisdiction to regulate shipping zones to 100 nautical miles off her coasts and authorizes Canada to establish exclusive fishing zones adjacent to the coasts but beyond the new 12 mile territorial sea. The act also considers international law and policy regarding the legal regime of Arctic waters, contiguous zones, archipelagoes waters and passage in international straits. These waters and the coastal states are considered regarding pollution prevention, law-of-the-sea and international agreement. (Ensign-PAI)
W71-05515

GIBSON V HOFFMAN (DISPUTE OVER OWNERSHIP OF MARSH MEADOW).

310 Pa 51, 164 A 783-786 (1933).

Descriptors: *Pennsylvania, *Boundaries (Property), *Boundary disputes, *Land tenure, High water mark, Low water mark, Riparian land, Rivers, Banks, Dikes, Marshes, Real property, Legal aspects, Judicial decisions.

In an action in ejectment over riparian land, a deed conveying '5 acres of marsh meadow bounded by river' was construed by the Supreme Court of Pennsylvania to convey adjacent land between low and high water marks. A subsequent deed describing the boundary as the top of the river bank, which was an artificial bank, was also held to include land between high and low water marks. Possession of the uplands was sufficient possession of the adjacent flat lands. (Hart-Florida)
W71-05529

TOVALOP - ITS ORIGIN, DEVELOPMENTS, STATUS, AND OBJECTIVES,
International Tanker Owners Pollution Federation, Ltd., London, England.
For primary bibliographic entry see Field 05G.
W71-05532

KILLMASTER V ZEIDLER (ADVERSE POSSESSION OF RIPARIAN TRACT AND ITS ACCRETIONS).

269 Mich 377, 257 NW 721-723 (1934).

Descriptors: *Michigan, *Land tenure, *Riparian land, *Accretions (Legal aspects), Real property, Prescriptive rights, Riparian rights, Saw mills, Judicial decisions, Legal aspects.

In an action to quiet title to a tract of riparian land, where the primary issue was adverse possession of the upland, the Supreme Court of Michigan held that accretions belonged to the owner of the riparian land to which the accretions attached. (Hart-Florida)
W71-05536

CONGRESS PASSES WATER QUALITY IMPROVEMENT ACT OF 1970.
In: Man's Control of the Environment, Congressional Quarterly, Washington, DC, p 28-31.

Descriptors: *Legislation, *Oil wastes, *Mine wastes, *Ships, *Sewage, *Water pollution control, Cleaning, Federal government, Grants.
Identifiers: *Liability, Great Lakes, Alaska.

The Water Quality Improvement Act of 1970 was passed by Congress and signed into law April 3. The action by the House and Senate of the bill (HR 4148) is traced from its inception to the final action. The Law declares as U.S. policy that there should be no oil discharged into navigable waters of the U.S. or adjoining shores. Petroleum companies are made liable for up to $14 million in oil spill cleanup costs. Control over hazardous polluting substances, sewage from vessels, mine water pollution, Great Lakes pollution are also covered by this law. Training grants and scholarships for antipollution programs are included. The Law also created an office of Environmental Quality to act as a staff for the President's Council on Environmental Quality. (Ensign-PAI)
W71-05542

U.S. AND UN DEBATE MAN'S USES AND ABUSES OF THE SEA.

In: Man's Control of the Environment, Congressional Quarterly, Washington, DC, p 77-81.

Descriptors: *Exploitation, *Preservation, *International waters, *Industrial wastes, *Legislation, Fisheries, Mineral industry, Continental shelf, United Nations.

International efforts to regulate exploitation and protect marine resources are discussed. Organization, administration and the relationships between national and international authority are considered. (Ensign-PAI)
W71-05543

RIM OF THE SEA BECOMING CROWDED AND DIRTY.
In: Man's Control of the Environment, Congressional Quarterly, Washington, DC, p 21-27.

Descriptors: *Federal government, *Legislation, *International law, *Political aspects, *Water pollution control, *Coasts, *Great Lakes, *International waters, *National seashores, *National lakeshores, Oil, Accidents, Construction, Dredging, Sewage.

Offshore oil spillls, building developments, dredging, sewage and industrial waste are problems to be faced by coasts around the world. The rim of the sea is a natural resource which can no longer be taken for granted as either a food source or for aesthetics and amusement. The major mishaps in oil transporting and drilling are traced along with other pollution causes. The politics of pollution, federal legislation, and international agreements are discussed. Ideas for development, preservation, pollution control and remedies to coastal problems are presented. (Ensign-PAI)
W71-05544

THE FEDERAL-STATE PARTNERSHIP MANAGING THE COASTAL ZONE,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-05546

SCHALLER V TOWN OF FLORENCE (VAG TION OF DEDICATION OF BEACH PUBLIC).

259 NW 529-535 (Minn 1935).

Descriptors: *Minnesota, *Lakes, *Meandc *Boundaries (Property), Mississippi River, Ripa an rights, High water mark, Low water ma Shores, Lake shores, Beaches, Littoral, Recreati Boats, Ships, Judicial decisions, Legal aspects.

Plaintiff riparian landowner brought action agai defendant town to have a plat vacated and lands dedicated therein vested in plaintiff. T disputed littoral land had been dedicated to public for use as a steamboat landing. However, land was abandoned for that purpose and was us as a bathing beach. From a lower court finding t the beach could be used by the public only fo steamboat landing and holding that, since this was abandoned, the public no longer had rights the beach, defendant appealed. The Supre Court of Minnesota determined that the dedicat intended to convey to the public all of the bea the steamboat provision being only an additio burden upon the beach. Stating that a meander li is not necessarily the shoreline, the court c cluded that the dedication extended to the wat edge rather than the meander line. Since vacati of the dedication and plat would not be in the b interests of the general public, the court deni plaintiff's petition, reversing the lower court's de sion. (Hart-Florida)
W71-05583

CROUCHER V WOOSTER (DISPUTE OVE OWNERSHIP OF LITTORAL LAND BETWE HIGHWAY AND LAKE).
271 Mich 337, 260 NW 739-742 (1935).

Descriptors: *Michigan, *Riparian land, *Ripari rights, *Land tenure, Boundaries (Property Lakes, Recreation, Littoral, Real property, Bou dary disputes, Legal aspects, Judicial decisio Shores, Highways.

Plaintiff riparian landowner brought action to qui title against defendant upland landowner. Plaint claimed title to a narrow strip between a lake and highway. Defendant's lot was directly across t highway from plaintiff's. Defendant claimed ripa an rights in plaintiff's land through mesne co veyances from their common grantor. Plaint claimed title in fee through mesne conveyanc from their common grantor; however, the co veyance to plaintiff's predecessors occurred aft the conveyance of riparian rights to defendan predecessors. The Supreme Court of Michigan o served that defendant held the same riparian righ as if there were no intervening highway. Since t conveyance through defendant's chain of title o curred first, the court held that no title passed plaintiff. The court furthermore held that an assig ment of the residue from the common grantor decedent estate also passed no title. (Hart-Florida W71-05620

A METHODOLOGY STUDY TO DEVELO EVALUATION CRITERIA FOR WILD AN SCENIC RIVERS,
Idaho Univ., Moscow. Water Resources Researc Inst.
For primary bibliographic entry see Field 06B.
W71-05623

STATE V MONTELEONE (STATE'S POLIC POWER TO CONSERVE FISH IN IT

WATERS).

171 La 437, 131 So 291-293 (1930).

Descriptors: *Louisiana, *Fish, *Permits, *Fish conservation, Legislation, Commercial fishing, Fish management, Regulation, State governments, State jurisdiction, Judicial decisions, Governments, Natural resources, Wildlife management, Commercial fish, Taxes, Preservation, Public rights, Administrative agencies, Legal aspects.
Identifiers: Constitutionality.

Defendant was convicted of violating a statute requiring wholesale fish dealers to procure a license from the Louisiana Department of Conservation. Defendant contended that the license requirement was an exercise of the state's taxing power. However, the title of the statute indicated that the purpose of the act was to conserve and protect fish. Defendant contended that the statute was therefore unconstitutional in that the objects of the statute were broader than its title. In denying defendant's appeal, the Supreme Court of Louisiana held that a dealer in commercial fish is engaged in a business which is within the control of the state under its police power. The fish are owned by the state in its sovereign capacity and are a part of the state's natural resources. When the privilege to purchase commercial fish for resale is granted, the state may exact such charges and impose such conditions as it may deem necessary to secure the preservation and conservation of its property. The license is not a tax for revenue, but a condition precribed by the sovereign for the divestiture of its title. (Smiljanich-Florida)
W71-05627

FELEPE V TOWN OF AMERICA (DAMAGES DUE TO ALTERATION OF DRAINAGE SYSTEMS BY TOWN).

219 NW 158-159 (Minn 1928).

Descriptors: *Minnesota, *Surface drainage, *Drainage systems, *Surface waters, Surface runoff, Drains, Culverts, Ditches, Embankments, Highways, Maintenance, Diversion, Discharge (Water), Flood damage, Floods, Rainfall, Damages, Crops, Legal aspects, Judicial decisions, Cities.

Plaintiff landowners sought to enjoin defendant towns from maintaining culverts and embankments whereby surface waters were collected and diverted from one drainage system into another, thereby flooding plaintiff's lands and damaging his crops. The towns, during improvement of a highway, had dammed the outlet in one ditch so that waters were diverted to another ditch. Plaintiff was granted injunctive relief and damages. Defendants appealed an order denying a new trial. The Supreme Court of Minnesota affirmed. The evidence supported the finding that defendants wrongfully altered the drainage systems, discharging more surface water into one ditch and thereby flooding and damaging plaintiff's land. In improving and maintaining public highways, towns are without authority to change substantially or interfere with the operation of existing public drainage systems. (Duss-Florida)
W71-05628

CAIN V CITY OF JACKSON (CITY'S RESPONSIBILITY FOR CULVERTS).
152 So 295-296 (Miss 1934).

Descriptors: *Mississippi, *Culverts, *Obstruction to flow, *Flood damage, Floodwaters, Floods, Flood control, Streamflow, Streams, Creeks, Running waters, Civil engineering, Legal aspects, Judicial decisions, Water law, Adjudication procedure.

Plaintiff sought to recover damages caused by the alleged negligence of defendant city. The damages resulted when water overflowed plaintiff's property. Plaintiff's premises bordered a natural watercourse which flowed under a city street. The city provided a double-barrel culvert for the watercourse under the street. In the trial, engineers testified that this culvert was adequate, but further stated that such double-barrel culverts were more likely to be obstructed than one culvert the size of the two. The jury was instructed that the city was only required to provide a sufficient outlet to handle the ordinary water of the stream and that the city was not liable for damages caused by the collection of debris unless placed there by the city. On appeal, the plaintiff contended that this instruction was error. The Supreme Court of Mississippi reversed. It was a question of fact as to whether the drainage was adequate. The city was not relieved of its duty to keep the culvert free of obstructions by the fact that such obstructions were not placed there by the city. (Robinson-Florida)
W71-05631

HUDSON V TOWN OF MORGANTON (REGULATIONS DEPRIVING OWNERS OF FULL USE OF WATERSHED LAND).
171 SE 329-330 (NC 1933).

Descriptors: *North Carolina, *Watersheds (Basins), *Eminent domain, *Compensation, Damages, Local governments, Cities, Governments, Small watersheds, Land use, Remedies, Watershed management, Legal aspects, Judicial decisions, Land, Real property, Condemnation, Easements, Farms, Land management, Management, Environmental sanitation.

Defendant town established a watershed and promulgated rules prohibiting trespass on watershed property and requiring owners of watershed lands to take certain steps to insure sanitary conditions. Plaintiff claimed that such regulations deprived her of the full use of her farm land without compensation. The Supreme Court of North Carolina affirmed a lower court judgment for defendant. Defendant acquired no easement on plaintiff's land, nor did it trespass thereon physically. Where defendant did not physically invade plaintiff's property, plaintiff's apprehension of prosecution for violating defendant's rules deprived her of no rights requiring compensation. Moreover, plaintiff admitted that defendant provided her with no instructions as to sanitation. Since such instructions were required by statute, plaintiff could not have been subjected to penalty for breaking the regulations. (Dye-Florida)
W71-05635

JONES V EUPER (STATE'S TITLE TO ISLANDS IN NAVIGABLE STREAMS).
182 Ark 969, 33 SW2d 378-379 (1930).

Descriptors: *Arkansas, *Prescriptive rights, *Navigable rivers, *Islands, Boundary disputes, State jurisdiction, Boundaries (Property), Accretion (Legal aspects), Streams, Stream erosion, Accelerated erosion, Riparian rights, Alteration of flow, Diversion, Legislation, State governments, Judicial decisions, Legal aspects, Land tenure, Navigable waters.

Plaintiff landowner sued defendant sand and gravel company for damages to an island in a navigable stream. Plaintiff contended that defendant's operations caused a change in the river's course, thereby damaging plaintiff's island. Defendant contended that plaintiff had failed to establish his title to the island, arguing that plaintiff had failed to follow the correct procedure in acquiring title to the island from the state. Affirming a trial court decision for defendant, the Supreme Court of Arkansas noted that plaintiff's only possible claim to the island was by adverse possession. A statute provided that all islands formed subsequent to the admission of the state into the Union were the property of the state, subject to sale in the manner provided by the statute. As plaintiff had failed to follow this procedure, he could not alternatively claim title to the island through adverse possession. Title to state-owned islands in navigable streams cannot be acquired by adverse possession. (Smiljanich-Florida)
W71-05638

KEITH V DRAINAGE DIST NO 7 (LANDOWNER'S ACCRUAL OF CAUSE OF ACTION FOR TAKING OF PROPERTY).
36 SW2d 59-64 (Ark 1931).

Descriptors: *Arkansas, *Drainage districts, *Eminent domain, *Compensation, Reservoirs, Reservoir sites, Condemnation, Drainage programs, River flow, Diversion, Riparian rights, Submergence, Flood control, Natural flow doctrine, Alteration of flow, Administration, Local governments, State governments, Judicial decisions, Legal aspects, Flooding.

Plaintiff landowner sued defendant drainage district for damages caused by defendant's taking of plaintiff's land. Defendant had diverted the waters of a river from their natural course and impounded the waters in a reservoir, damaging plaintiff's land by submerging fertile ground. Defendant contended that plaintiff's land was sold prior to the accrual of the cause of action. In reversing the trial court's judgment for defendant the Supreme Court of Arkansas noted that plaintiff's cause of action accrued upon the defendant's filing of plans for the drainage district, which indicated that plaintiff's lands would be submerged. Where there is any invastion of private property by lawful authority for a public use, and the property is damaged thereby, there is a taking of land requiring the public to compensate the landowner for the deprivation of the beneficial use of his property. For purposes of determining right to compensation, the taking of private property occurs when the landowner's petition is filed. A subsequent diverstiture of his title does not work a forfeiture of plaintiff's cause of action. (Smiljanich-Florida)
W71-05642

DENNIG V GRAHAM (INJUNCTION TO PREVENT FISHING IN PRIVATE STREAM AND SPRING).
59 SW2d 699-703 (Mo App 1933).

Descriptors: *Missouri, *Remedies, *Fishing, *Adjudication procedure, Recreation, Fish stocking, Fly fishing, Fish, Springs, Streams, Rivers, Legal aspects, Judicial decisions, Navigable waters, Nonnavigable waters, Ownership of beds.

Plaintiff riparian landowner sought to enjoin defendant sportsman from fishing in his stream. Plaintiff owned a large tract upon which was located a large spring. The spring water formed a non-navigable stream which flowed into a nearby river. The spring and stream were stocked with fish at plaintiff's expense. Defendant had repeatedly fished the stream in spite of plaintiff's request for him not to do so. Notwithstanding defendant's testimony that he did not intend to fish the stream in the future, the evidence was held sufficient to show that defendant intended to fish the stream, indicating a reasonable probability of injury to plaintiff. Defendant contended that plaintiff's right to have him prosecuted for trespass was an adequate remedy at law. This contention was rejected. Concluding that plaintiff was threatened with irreparable harm, the Spring Court of Appeals of Missouri granted the injunction. (Hart-Florida)
W71-05661

SUPERIOR COAL AND BUILDERS SUPPLY CO V BOARD OF EDUC (LIABILITY FOR ALTERATION OF NATURAL LAND DRAINAGE).
260 Ky 84, 83 SW2d 875-876 (Ct App Ky 1935).

Descriptors: *Kentucky, *Surface drainage, *Historic flood, *Excessive precipitation, Rainfall, Artificial watercourses, Alteration of flow, Natural streams, Watercourses (Legal), Drainage, Drainage water, Surface waters, Floods, Runoff,

Rainfall-runoff relationships, Rainfall intensity, Damages, Riparian rights, Natural flow doctrine, State governments, Legal aspects, Judicial decisions.
Identifiers: *Negligence, *Act of God.

Plaintiff company sued defendant state agency for damages to plaintiff's land. Plaintiff contended that defendant substituted an artificial drain for a natural watercourse which, in periods of heavy rainfall, was inadequate in size. Plaintiff contended that water subsequently accumulated on its land, flooding and destroying it. Defendant contended that there was no allegation of negligence in plaintiff's petition and that the rains referred to were of an extraordinary nature. In affirming the trial court dismissal of plaintiff's petition, the Court of Appeals of Kentucky noted that the term 'heavy rainfall' must be construed as extraordinary rainfall, for which defendant would not be liable in the absence of negligence. As plaintiff had not alleged negligence by the defendant, its petition was properly dismissed. A landowner is entitled to the natural drainage of his land. However, in absence of negligence in the installation or maintenance of a substitute drainage for a natural watercourse, liability is limited to the result of ordinary rains, not an Act of God. (Smiljanich-Florida)
W71-05668

POLITICAL GEOGRAPHY OF THE ISRAELI-SYRIAN BOUNDARY DISPUTE, 1949-1967,
State Univ. of New York, Buffalo.
J. S. Haupert.
Professional Geographer, Vol 21, No 3, p 163-171, May 1969. 4 fig, 15 ref.

Descriptors: *Boundary disputes, *Political aspects, *Arid lands, *Geographical regions, *Political constraints, Water resources development, History, Economic impact, Social impact, Maps, Water resources, Water control, Legal aspects, Water rights, Riparian rights, Boundaries (Property), Foreign countries.
Identifiers: *Israel, *Syria, *Middle East.

Boundary claims arising from extended hostilities between nations have been major factors in political disputes since World War II. The 18-year series of conflicts between Israel and Syria along their politically contrived borders have largely involve water ways and riparian rights. Three demilitarized zones were imposed over territory allocated to Israel by the UN partition plan and the armistice agreement: (1) northern, near Kibbutz Dan, through which the River Dan flows to the Jordan River, (2) central, west of the Jordan River near the B'not Yaakov bridge and (3) southern, located in part of the Yarmuk 'triangle' southeast of Lake Kinneret. Between 1951-53, Israel embarked upon 2 major water projects--drainage of the Hula swamps and diversion of the Jordan River. The Hula Valley alone counts for 60% of all of Israel's water resources. The Syrians objected to the Hula project because the drainage canal would traverse the demilitarized zone and infringe upon Arab cultivation rights, as would the river diversion project. Over the years both countries supported accelerating claims by their nationals on extension of cultivation in the zones. Work on a hydro-electric project near the B'not Yaakov bridge elicited objections because it endangered traditional Syrian right of access for livestock and irrigation. Water transfer from Lake Kinneret to the Negev Desert without Arab cooperation or negotiation over fishing and cultivation rights led to retaliatory raids into Israel and artillary shelling from the Golan Heights. All of this was part of a larger political and social struggle, which is described in detail. (Casey-Arizona)
W71-05711

INTEGRATION OF CONNECTICUT WATER RIGHTS LAWS AND POLLUTION CONTROL LAWS,
Connecticut Univ., Storrs.
Theodore Pocht, Robert L. Leonard, and Robert Reis.
Available from NTIS as PB-198 000, $3.00 in paper copy, $0.95 in microfiche. Completion Report, November 17, 1969. 18 p. OWRR Project A-012-CONN (4).

Descriptors: *Connecticut, *Water pollution control, *Water rights, *Water utilization, Legislation, Legal aspects, Judicial decisions, Industrial water, Industrial wastes, Municipal water, Municipal wastes, Riparian rights, Discharge (Water), Sewage, Environmental effects, Regulation, Costs, Benefits, Surface waters, Groundwater, Research and development, Recreation, Water pollution, Administrative agencies.

As a guide for integration of Connecticut water rights laws and pollution control laws, the research project described in these reports examines: (1) the adminstrative structure for regulation of water resources, (2) case law on water resources, (3) the economics of water utilization, (4) the effectiveness of riparian rights in protecting recreational uses and environmental values, and (5) the efficacy of present pollution control laws and practices. The project attempts to provide a detailed background of Connecticut water law, criteria for evaluating water law and institutions, and a guide for needed changes in statutory law and administrative structure. The ability of administrative agencies to deal with water pollution problems has been improved by the passage of the Connecticut Water Pollution Control Act of 1967. Case law has not treated many areas of water use, but has developed classifications of water and rendered decision on such matters as riparian rights, municipal water supply and pollution problems. At present there is no economic need for a redefinition of water rights. There is a need for more economic incentives in pollution control laws and stronger regulation to assure adequate streamflow and reduce waste discharges. (Duss-Florida)
W71-05718

WATER POLLUTION PREVENTION REQUIREMENTS IN RELATION TO FARM-WASTE DISPOSAL,
Thames Conservancy (England). Chief Purification Officer.
For primary bibliographic entry see Field 05G.
W71-05753

KELLY V KANSAS CITY BLDG AND LOAN ASS'N (LIABILITY TO ADJOINING LANDOWNER FOR OVERFLOW OF SEPTIC TANK).

86 SW2d 975-978 (Ct App Mo 1935).

Descriptors: *Missouri, *Septic tanks, *Public health, *Damages, Judicial decisions, Legal aspects, Cesspools, Domestic wastes, Sewage bacteria, Gases, Mosquitoes, Human diseases, Environmental sanitation, Safety, Sanitary engineering, Social aspects, Organic wastes, Sewage, Sewage treatment, Waste disposal, Real property, Odor, Fouling, Air pollution, Adjudication procedure.

Plaintiff landowner sued defendant company for injuries caused by overflow onto plaintiff's property from defendant's septic tank. Plaintiff contended the defendant's septic tank was negligently allowed to drain onto plaintiff's property, emitting four gases and odors, and attracting flies and mosquitoes. Plaintiff contended that as a result she suffered permanent injury to her health. Defendant generally denied the allegations and contended that plaintiff's injuries were caused by her privy vault or cesspool which had not been cleaned properly and which allowed water to run on the ground. The Kansas City Court of Appeals affirmed a jury verdict and judgement for plaintiff stating that the questions of defendant's negligence and plaintiff's contributory negligence were for the jury. If overflow from a septic tank causes injury to an adjoining landowner, a factual determination of negligence by the trial court must be respected by an appellate court. (Smiljanich-Florida)
W71-05772

ACCESS--ITS EFFECT ON AREA GROWT AND ENVIRONMENTAL QUALITY.
Washington State Water Research Center, Pu man.
For primary bibliographic entry see Field 06B.
W71-05776

ACCESS TO WATER,
Washington State Environmental Quality Di Olympia.
Charles Roe.
In: 'Access--Its Effect on Area Growth and E vironmental Quality,' Central Washington Sta College, Ellensburg, Washington, May 15, 1970, 36-46. OWRR Project A-999-WASH (3).

Descriptors: *Legal aspects, Environment, Ecol gy, Natural resources, Conservation.
Identifiers: *Environmental policy, Environmenta quality, Water resources planning.

Water is one of the greatest natural resources in th state of Washington. Litigation over access t water in the state is common and almost alwa bitter. These cases have involved cities, sportsme conservationists, and Indians. One case cited is th over Lake Chelan: A dam built on the lake causes thirty foot change in water level at various times the year. The court ruled that the public had a righ to use water for recreation when at its high leve but not to trespass privately-owned land when ex posed by low level of water (Wilbour vs. Gallaghe 1969). In 1967 the state legislature provided th Water Resources agency with authority to establis minimum flows and levels on lakes for the purpos of protecting fish and wildlife interests, aesthetic values and water quality. The state administratio is now in the process of developing comprehensiv sewerage drainage abatement plans. Washingto also cooperates with the national policy of not al lowing water to be degraded below existing quality A Department of Ecology has been formed to de with all related problems efficiently. (See als W71-05776) (Wray-Chicago)
W71-05779

The Differential Effects of Advanced Communica tion, Transportation, Centralization, and Affluenc on Disaster Relief in a Kentucky Town,
Kentucky Univ., Lexington.
C. Ronald Rosenteil.
Mimeographed 1970. 15 p, 2 ref. OWRR Projec A-022-KY (5).

Descriptors: *Social change, Social aspects, Com munication, Kentucky, *Disasters.
Identifiers: *Regional development, Social system Citizen participation.

The area studied is Mahogany, a Kentucky country with a population of approximately 10,000. The county seat, Disasterville, has a fairly stable popu lation of 2500. In the county there has been a con tinuing shift of economic and cultural focus away from the small towns and toward the county seat and the large metropolitan area thirty miles away. Part of this shift of focus is due to the independence and mobility of people, which is the result of per sonalized efficient transportation made possible by the automobile. Technological advancement in transportation and communication along with the concomitant developments in centralization and af fluence have affected the county and its citizens. This report shows how these variable differentially affect disaster-related behavior and relief. A tor nado struck and seriously damaged Disasterville in 1968. Word of the disaster spread quickly by radio, television, phone, and car, though the information was sometimes distorted. Great amounts of aid flowed into the town, but a systematic scheme for relief was lacking. An education program on the nature of tornadoes and action to be taken in emergencies was advised for the town. (Wray-Chicago)
W71-05782

A DIGEST OF ENVIRONMENTAL POLLUTION LEGISLATION IN CANADA, WATER.
Canadian Industries Ltd., New Toronto (Ontario).

For primary bibliographic entry see Field 05G.
W71-05804

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER. VOLUME I - SUMMARY.
International Lake Erie Water Pollution Board; and International Lake Ontario-Saint Lawrence River Water Pollution Board.
For primary bibliographic entry see Field 05G.
W71-05805

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE SAINT LAWRENCE RIVER, VOLUME II - LAKE ERIE.
International Lake Erie Water Pollution Board; and International Lake Ontario-Saint Lawrence River Water Pollution Board.
For primary bibliographic entry see Field 05G.
W71-05806

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE SAINT LAWRENCE RIVER. VOLUME III - LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE SAINT LAWRENCE RIVER.
International Lake Erie Water Pollution Board; and International Lake Ontario-Saint Lawrence River Water Pollution Board.
For primary bibliographic entry see Field 05G.
W71-05807

INTERNATIONAL LEGAL CONFERENCE ON MARINE POLLUTION DAMAGE, FINAL ACT OF THE CONFERENCE WITH ATTACHMENTS INCLUDING THE TEXTS OF THE ADOPTED CONVENTIONS.
Inter-Governmental Maritime Consultative Organization, London.
For primary bibliographic entry see Field 05G.
W71-05810

PUBLIC USE OF RESERVOIR AREAS--CAMPING.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 35, No 105, p 8447, May 1970. 1 p.

Descriptors: *Reservoir sites, *Camping, *Recreation facilities, *Camp sites, Federal government, Administrative decisions, Tourism, Reservoirs, Flood control, Reservoir operation, Recreation, Safety, Public benefits, Non-consumptive use, United States, Regulation, Administration, Legislation, Adoption of practices, Administrative agencies, Social aspects, Legal aspects.

Pursuant to the amended Flood Control Act of 1944, the Secretary of the Army herein sets forth regulations concerning the public use of reservoir areas as camp sites. Subject to limitations, camping in reservoir sites is consistent with the public interest and with the operation and maintenance of the reservoirs. Camping is permitted only in certain designated areas. The length of stay is limited to certain times, dependent upon the type of camping and the available facilities. Provision is made for camping fees. Campers may not install permanent facilities, nor may camping equipment be abandoned or left unattended for 48 hours or more. Proper camping sanitation must be observed. The building of camp and grass fires is regulated. (Smiljanich-Florida)
W71-05813

EXECUTIVE ORDER 11523, ESTABLISHING THE NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL.
Exec Order No 11523, Federal Register, Vol 35, No 71, p 5993-5994, April 1970. 2 p.

Descriptors: *Industries, *Water pollution control, *Administrative agencies, *Water quality control, Pollution abatement, Supervisory control (Power), Federal government, Administration, Regulation, Administrative decisions, Jurisdiction, Decision making, Water pollution sources, Inter-agency cooperation, Legal aspects, Industrial production, Industrial wastes, Industrial plants, Environment, Environmental effects, Water pollution, Waste disposal, State governments, Local governments.
Identifiers: *National Environmental Policy Act.

In furtherance of the purpose and policy of the National Environmental Policy Act of 1969, the President of the United States in this executive order creates the National Industrial Pollution Control Council. The secretary of Commerce is given the responsibility of appointing the members of the Industrial Council, composed of representatives of business and industry. The Industrial Council shall advise on programs of industry relating to environmental quality. In particular its functions are to: (1) survey and evaluate industrial plans and actions in the field of environmental quality; (2) recommend solutions to the problems of the effects on the environment of industrial practices; (3) provide liason among members of the business and industrial community on environmental quality matters; (4) encourage business and industrial improvement in environmental quality; and (5) advise on environmental quality plans and actions of federal state and local agencies affecting industry. Provision is made for subordinate committees, administrative and staff service, compensation for members, and regulation of the Council's operation. (Smiljanich-Florida)
W71-05814

MARYLAND'S WETLANDS: THE LEGAL QUAGMIRE,
Stuart Marshall Salsbury.
Maryland Law Review, Vol 30, No 3, p 240-266, 1970. 27 p, 158 ref.

Descriptors: *Wetlands, *Maryland, *Coastal marshes, *Tidal marshes, Swamps, Salt marshes, Bogs, Standing waters, Surface waters, Bodies of water, Marshes, Aquatic environment, Aquatic habitats, Governments, State governments, Legislation, Legal aspects, Regulation, Water law, Riparian rights, Dredging, Landfills.

Dealing with the legal problems of Maryland's wetlands, this article begins with a historical review of title to lands under navigable waters, followed by a historical discussion of common law and Maryland statutory riparian rights. Wetlands include such areas as swamps or marshes permanently, temporarily, or intermittently submerged or inundated. The terms accretion and reliction are also defined. A new Maryland wetlands statute provides a legal and geographical definition of the term 'wetlands'. The statute furthers a new state policy of preserving these wetlands. Wetlands are broken down into state and private wetlands. The statute provides more stringent requirements for dredging and filling on state wetlands than on private wetlands. This statute conforms more to the common law than did previous statutory law, in that the riparian owner is entitled to natural accretions only. This article further discusses the procedural requirements and penalties provided by this new statute. The legal considerations of the wetlands statute are detailed under the following headings: uncompensated taking of private property, repeal of former riparian rights sections, and the public trust doctrine. (Robinson-Florida)
W71-05815

DANGER ZONE REGULATIONS (FORT MONROE, VIRGINIA).
Corps of Engineers, Washington, D.C.

Federal Register, Vol 35, No 80, p 6575, April 1970. 1 p.

Descriptors: *Rivers and Harbors Act, *Bays, Administration, *Regulation, Navigable waters, United States, Legislation, Administrative agencies, Decision making, Adoption of practices, Administrative decisions, Governments, Federal government, Legal aspects, Bodies of water.
Identifiers: *Forts, Administrative regulations.

Pursuant to the provisions of section 7 of the Rivers and Harbors Act of 1917, this regulation, promulgated by the Corps of Engineers, governs the danger zone in the Chesapeake Bay off Fort Monroe, Virginia. Passage of vessels through the area will not be prohibited at any time. Commercial fishermen will be allowed to fish within this area, but no loitering or anchoring for other purposes will be allowed. No firing will be allowed during periods of darkness or poor visibility. The Commander, Fort Monroe, Virginia, is responsible for providing an advance firing schedule to the Coast Guard, who will enforce this regulation. (Robinson-Florida)
W71-05816

EXECUTIVE ORDER 11528 (CHANGING THE JURISDICTION AND MEMBERSHIP OF THE NEW ENGLAND RIVER BASINS COMMISSION).

Exec Order No 11528, Federal Register, Vol 35, No 82, p 6695-6696, April 1970. 2 p.

Descriptors: *Water Resources Planning Act, *River basin commissions, *Jurisdiction, *Leadership, River basin development, Water resources development, Legislation, Water resources, Administration, Federal government, State governments, Legal aspects, Water utilization, Interstate commissions, Interstate compacts, Water supply, Water conservation, Water policy, Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York.
Identifiers: *Executive orders.

By virtue of the authority vested in him by the Water Resources Planning Act, the President herein changes the jurisdiction and membership of the New England River Basins Commission. The Commission's jurisdiction shall consist of all or specified portions of the following states or areas: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York and Long Island Sound. The membership of the New England River Basins Commission shall consist of: (1) a chairman appointed by the President; (2) one member each from the Department of Agriculture, Department of the Army, Department of Commerce, Department of Health, Education and Welfare, Department of Housing and Urban Development, Department of the Interior, Department of Transportation, Atomic Energy Commission, and Federal Power Commission; (3) one member each from Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, and New York; and (4) one member from each interstate agency, created by interstate compact, whose jurisdiction extends to the waters of the specified areas. (Robinson-Florida)
W71-05817

AUTHORIZATION OF APPROPRIATIONS FOR COMMERCIAL FISHERIES RESEARCH AND DEVELOPMENT.

16 USCA sec 779b (Supp 1969) amending 16 USCA sec 779b (1964).

Descriptors: *Research and development, *Government finance, *Commercial fishing, *Grants, Fish establishment, Federal government, State governments, Legislation, Fish, Fish management, Fish conservation, Fisheries, Fish harvest, Administration, Legal aspects, Water resources development, Government supports, Regulation, Financing, Administrative agencies.

For the fiscal year beginning July 1, 1969, and for three succeeding fiscal years, 5 million dollars per year is appropriated for the Secretary of the Interior to carry out the purposes of this chapter. Also, $650,000 per year for the same period is to be made available to the states in such amounts as the Secretary may deem appropriate for the purposes of this chapter. The Secretary shall give preference to those states in which there is a commercial fishery failure resulting from natural or undetermined causes. Such funds are not to be used as grants for chartering fishing vessels. There is also appropriated $100,000 per year which shall be available for the Secretary to give to the state, in such amounts as he deems necessary, to develop new commercial fisheries. (Robinson-Florida)
W71-05818

ABANDONED MINE DRAINAGE CONTROL ACT OF 1970 (LAND RECLAMATION FOR WATER POLLUTION CONTROL).
Md Code Ann art 66c, secs 674a thru 674h (Supp 1970).

Descriptors: *Maryland, *Mine drainage, *Water pollution control, *Land reclamation, Mining, Mine wastes, Coal mine wastes, Strip mine wastes, Mine water, Water pollution sources, Water pollution, Pollution abatement, Land use, Water resource development, Land development, Legislation, Taxes, State governments, Surface drainage, Conservation, Revegetation, Public health.

In order to restore polluted state waters to the quality necessary to support fish and wildlife, recreation, and other beneficial uses, the Secretary of the Maryland Department of Natural Resources is authorized to acquire and rehabilitate land occupied or degraded by abandoned mines. The Secretary may take whatever action is necessary to prevent, control, and abate water pollution from such land. The Board of Public Works is authorized to issue Mine Reclamation and Water Quality Restoration Loan certificates for five million dollars and to sell them at public sale to the highest bidder. The proceeds of such loans are to be used exclusively for acquisition, improvements, or rehabilitation of abandoned mine property or for pollution control or treatment facilities. If the proceeds are used to rehabilitate privately owned land, the owner must contribute an amount at least equal to the resulting increase in the value of his land. An annual property tax is imposed to meet the interest and principal payments on the loan fund. The Secretary may backfill, grade, revegetate or seal mines, and control erosion and drainage to implement the purposes of the Act. Land acquired and rehabilitated may then be sold, retained, or transferred to a subdivision of the state. All proceeds from such sales shall constitute an Abandoned Mine Drainage Capital Fund to be used for the same purposes as the loan fund. The Department of Natural Resources may cooperate or undertake joint projects with other state agencies and political subdivisions and may procure any available federal assistance. (Liptak-Florida)
W71-05819

A STUDY OF THE RIPARIAN AND PRIOR APPROPRIATION DOCTRINES OF WATER LAW,
Georgia Univ., Athens. School of Law.
E. Ben R. Lancaster, and Bryan M. Storey.
Institute of Law and Government, School of Law, University of Georgia, Oct 1955. 204 p, 282 ref, append.

Descriptors: *Georgia, *Riparian rights, *Prior appropriation, *Natural flow doctrine, Alteration of flow, Artificial use, Civil law, Competing uses, Diversion, Domestic uses, Legal aspects, Judicial decisions, Legislation, Natural use, Ownship of beds, Reasonable use, Relative rights, Riparian land, Riparian waters, Water pollution, State governments, Appropriation, Preferences (Water rights), Administrative agencies, Beneficial use.

The two basic doctrines of American law relating to the utlization of waters--the riparian and prior appropriation doctrines--are examined in this work. Chapter I treats Georgia's existing water laws, particularly the riparian doctrine as declared by Georgia statutes and judicial decisions. The various legal classes of waters and the applicable legislation are also noted. In addition the important Georgia cases are summarized and categorized as to facts and rationale. Chapter II is devoted to the doctrine of prior appropriation. In this chapter the history of the prior appropriation doctrine is traced, and the doctrine's important features are described. The constitutional problems confronting lawmakers in the enactment of water rights legislation are discussed in Chapter III. Emphasis is placed upon constitutional problems in converting from a riparian rights system to a system of prior appropriation. The advantages and disadvantages of the two water law doctrines are analyzed in the summary and conclusion, along with some broad deductions drawn from the study. The primary advantage of the riparian doctrine is stated to be flexibility, permitting facile adjustment to changing circumstances; however, the same flexibility creates uncertainty as to the extent of the riparian right. (Hart-Florida)
W71-05820

COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES: A QUARTER-CENTURY OF UNITED STATES ASSISTANCE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 03B.
W71-05821

ARKANSAS GAME AND FISH COMM'N V STORTHZ (OWNERSHIP OF FISH IN PRIVATE LAKES).

181 Ark 1089, 29 SW2d 294-297 (1930).

Descriptors: *Arkansas, *Fishing, *Fish, *Nonnavigable waters, Lakes, Ponds, Surface waters, Ownership of beds, Riparian rights, Beds under water, Legal aspects, Judicial decisions, Water law, State governments, Damages, Land tenure, Administrative agencies, Contracts.
Identifiers: *Ownership of lakes.

Plaintiff landowner sought the cancellation of contracts given by defendant, the Arkansas Game and Fish Commission, for the exclusive right to trap and seine fish in two lakes on land owned by the plaintiff. Plaintiff also sought a judgment for the value of the fish taken an a restraining order against further fishing. The lakes were not connected with any navigable stream. The trial court dismissed the complaint in part but awarded damages. Plaintiff appealed, alleging that the lakes were private lakes, and defendant contended that the state owned the fish. The Supreme Court of Arkansas affirmed the award of damages and reversed the trial decision dismissing part of the complaint. Where a lake or pond is entirely within the land of one owner and there is no means of passage by which the fish can migrate to the waters of other owners, the landowner possesses the fish and fishing rights. (Robinson-Florida)
W71-05822

UNITED STATES V 687.30 ACRES OF LAND (RIGHT OF UNITED STATES TO CONDEMN LAND FOR RIVER IMPROVEMENT PROJECT).

319 F Supp 128-134 (D Neb 1970).

Descriptors: *Eminent domain, *United States, *Treaties, *Indian reservations, Federal government, Condemnation, Land, Land tenure, Administrative agencies, Administrative decisions, Nebraska, Missouri River, Multiple-purpose projects, Projects, Judicial decisions, Legal aspects, River basins, Water utilization, Irrigation, Navigation.

Plaintiff United States sought to condemn land o Nebraska belonging to defendant Indian tribe. T project was part of a comprehensive plan adopt by Congress to achieve maximum utilization of f water resources within the Missouri River Basi The Secretary of the Army made the decision t condemn the land pursuant to authority delegat by Congress in an 1888 act. Defendant contend that it owned the land by virtue of a treaty with t United States and that, while Congress cou abrogate the treaty and condemn the land, it cou only do so by specific legislation. Defendant al contended that the taking constituted deprivati of property without due process of law under t fifth amendment. The federal district court grant plaintiff's motion for summary judgment. Congre was not required to enact specific legislation condemn land owned by Indians. The decision condemn the land was a reasonable exercise authority delegated by Congress to the Secreta Defendant's due process argument was witho merit. (Duss-Florida)
W71-05823

WISCONSIN V ILLINOIS (STATE OBLIGATION TO ASSIST CITY IN COMPLYING WIT COURT DECREE).
289 US 395, 710, 53 Sup Ct 671-678 (1933).

Descriptors: *Illinois, *Diversion, *Lake Michiga *Cities, Wisconsin, Michigan, New York, Relativ rights, Diversion dams, Diversion losses, Lake State governments, Sewage, Sewage treatme Canals, Legal aspects, Judicial decisions, Gover ments, Federal government, United States.
Identifiers: *Chicago.

Plaintiff states of Wisconsin, Michigan and Ne York brought action to compel defendant Illino to assist Chicago in construction of sewage trea ment facilities to reduce diversion of water fro Lake Michigan. The municipality was financiall unable to complete the project. Defendant co tended that Chicago was the prime defendant in th original decree which had ordered Chicago to co struct a treatment plant to eliminate the diversio The United States Supreme Court observed tha Chicago was an instrumentality of defendant, an hence defendant was responsible. Defendant als contended that congressional legislation permitti diversion from Lake Michigan conflicted with th decree, but the Court held that the statute did no affect the decree, nor did possible restoration o the lake level through treaty and other legislation Defendant next asserted that, since under the term of the decree diversion was to be reduced gradually over a period of years, the decree had not yet beer violated and that defendant was not bound to exer cise its police power to reduce the diversion. How ever, the court observed that jurisdiction had beer retained. Defendant was ordered to furnish funds to enable Chicago to comply with the decree (Hart-Florida)
W71-05824

UNITED STATES EX REL GREATHOUSE V DERN (REFUSAL OF UNITED STATES TO GRANT WHARF PERMIT).

289 US 352, 53 Sup Ct 614-617 (1933).

Descriptors: *United States, *Permits, *Navigable rivers, *Condemnation, Administrative decisions, Docks, Rivers, Federal government, Administrative agencies, Highways, Roads, Riparian land, Riparian rights, Accretion (Legal aspects), Eminent domain, Condemnation value, Beds, Ownership of beds, Navigation, Adjudication procedure, Judicial decisions, Legal aspects.

On relation of a landowner, plaintiff United States brought mandamus against defendant Secretary of War to compel him to issue a permit to construct a wharf in a navigable river. Defendant had not refused to grant the permit because the wharf would obstruct navigation, but because the property was to be condemned for use as part of a highway. Plaintiff contended that his riparian rights

included the right to erect wharves which did not obstruct navigation. Defendant asserted that mandamus would not lie because neither the duty of defendant nor the right of plaintiff was clear. The United States Supreme Court, rejecting the contentions of both parties, held that mandamus would not be granted to require an idle act which would ultimately increase the government's condemnation cost. (Hart-Florida)
W71-05825

UNITED STATES V RIVER ROUGE IMPROVEMENT CO (REVIEW OF CONDEMNATION AWARD OF FEDERAL NAVIGATION PROJECT).
269 US 411, 46 Sup Ct 144-148 (1926).

Descriptors: *Michigan, *Riparian rights, *Condemnation value, *Rivers and Harbors Act, Eminent domain, Condemnation, Riparian land, Navigation, Navigable rivers, Docks, Piers, Compensation, Payment, Adjudication procedure, United States, Federal government, Legal aspects, Judicial decisions.

Plaintiff United States appealed from a condemnation award to defendant riparian landowner. The Rivers and Harbors Act permitted the value of special benefits accruing to remaining portions of the condemned property, exceeding ordinary benefits to the community, to be deducted from the condemnation award. However, the jury was instructed not to deduct appreciated property value as a special benefit and that subjection of riparian property to the congressional power to improve navigation might prevent special benefit from accruing. Plaintiff contended that these instructions were erroneous. The United States Supreme Court noted that: (1) riparian rights included access to the navigable stream and the right to construct landings and piers; (2) riparian rights in Michigan are determined by common law; (3) riparian rights are subordinate to the public right of navigation; and (4) Congress cannot impair riparian rights except to improve navigation. Determining that the increased value of the remaining land was a special benefit, and that the jury instruction on the congressional power to impair riparian rights was improper, the Court held that the lower court had committed reversible error. A new trial was granted. (Hart-Florida)
W71-05826

NEW YORK POWER AND LIGHT CORP V STATE (GRANTS OF RIGHTS IN NAVIGABLE STREAMS).
230 App Div 338, 245 NYS 44-65 (1930).

Descriptors: *New York, *Public rights, *Damsites, *Navigable rivers, State governments, Legislation, Governments, Riparian rights, Relative rights, Legal aspects, Judicial decisions, Electric power, Dams, Canals, Flow, Rivers, Navigable waters, Navigation, Streams, Contracts, Performance, Adjudication procedure, Projects, Sites, Diversion.

By legislative act plaintiff power company was granted the right to construct a dam in a stream. Plaintiff failed to exercise this rights, and defendant state, to divert water into a canal, constructed a dam on the site granted for plaintiff's dam. Plaintiff contended that defendant was infringing the rights granted to it by the legislature and sought damages for the value of those rights. The Supreme Court of New York affirmed a judgment for defendant. A state may unconditionally convey valid title in the bed of a navigable stream only for consideration and only in aid of navigation or public interests. A gift of rights or a grant of rights not in aid of navigation is conditional and subject to the state's paramount right to improve navigable streams. Moreover, a stream to be navigable need not be navigable throughout its entire length. The state holds the beds of navigable streams in trust for the people, and such beds may not be conveyed against the public interest. In the instant case: (1) there was no consideration; (2) the stream was navigable; (3) the grant to plaintiff was not in aid of the public interest; and (4) the state's construction of a dam improved navigation. (Dye-Florida)
W71-05827

LOUISIANA AND MISSISSIPPI RR TRANSFER CO V LONG (COMPENSATION FOR USE OF LANDOWNER'S RIVER BANKS FOR MOORING OF BOATS).
131 So 84-89 (Miss 1930).

Descriptors: *Mississippi, *Rent, *Banks, *Boats, Relative rights, Mississippi River, Louisiana, Remedies, Navigable waters, Navigable rivers, Railroads, Compensation, Reasonable use, Beds, Overflow, High water mark, Low water mark, Low water mark, Land tenure, Legislation, Legal aspects, Judcial decisions, Adjudication procedure, Watercourses (Legal).
Identifiers: *Conflicts of law, Mooring.

Plaintiff landowner sought in the Mississippi courts to recover the rental value of property used and occupied by defendant railroads. Defendants for many years operated railroad transfer boats across the Mississippi River and moored them upon plaintiff's property on the Louisiana side. Defendant contended there was no liability to plaintiff as Louisiana law controlled. Under such law rivers are highways, are open to the public, and everyone has the right to moor vessels on river banks. Defendants also contended that even if there was liability, the three-year Louisiana limitation on recovery should apply rather than the six-year Mississippi limitation, thereby reducing recovery. The trial court found for plaintiff and instructed the jury to assess damages at the claimed monthly rate for six years. The Supreme Court of Mississippi affirmed in part and reversed in part, holding that Louisiana law applied as to ownership of banks and, although the use of banks on navigable rivers is public, the owner of banks is entitled to compensation for mooring. As to the remedy, the Mississippi recovery limitation applied since it was the forum where the action was brought. (Duss-Florida)
W71-05828

FLOYD COUNTY V FINCHER (RECOVERY OF DAMAGES FOR PERMANENT INJURY FROM NUISANCE).

150 SE 577-579 (Ga 1929).

Descriptors: *Georgia, *Adjudication procedure, *Damages, *Highway effects, Local governments, Flooding, Legal aspects, Judicial decisions, Highways, Drainage water, Remedies, Drainage, Surface drainage, Ditches, Drainage effects, Land, Crops, Surface waters, Real property.

Plaintiff sought damages and an injunction for injury to his property resulting from construction of a public road by defendant county. Plaintiff alleged that the road caused drainage water to flow across his land, destroying his crops and extinguishing the value of his land for rental purposes. Plaintiff did not allege a decrease in value to his land resulting from defendant's actions. Defendant contended that plaintiff posed no cause for equitable relief and alleged no proper measure of damages. The Supreme Court of Georgia reversed the decision of a lower court overruling defendant's demurrer. Plaintiff was not entitled to an injunction against a continuing nuisance because roadbuilding is an important public function requiring an abuse of discretion for equitable relief. Plaintiff was left to an action for damages for the taking of his property, amounting to the difference in value before and after defendant's actions. However, no measure of damages was alleged for permanent injury to plaintiff's land. Thus plaintiff stated no cause of action. (Dye-Florida)
W71-05829

BRACKETT V BELLOWS FALLS HYDROELECTRIC CORP (PERSONAL INJURIES DUE TO TRESPASS OF WATER FLOW).
175 A 822-823 (NH 1934).

Descriptors: *New Hampshire, *Damages, *Floods, *Water levels, Legal aspects, Judicial decisions, Adjudication procedure, Flow, Watercourses (Legal), Dams, Rivers, Ponds, Hydroelectric plants, Land tenure, Water level fluctuations.

Plaintiff farm owner sued defendant hydroelectric corporation for damages. Defendant had raised the level of its dam so that the level of water at plaintiff's farm was also raised. As a consequence, a pool formed on plaintiff's field. No permission to so overflow was ever granted defendant, nor had defendant ever acquired flowage rights. Muskrats invaded the pool and built nests. While plaintiff was operating a horse-drawn mowing machine, one of the horses stepped in a muskrat hole and plaintiff was injured. Defendant contended that it was not liable for damages which were not probable nor should have been anticipated by it. The jury at the trial returned a verdict for plaintiff, and the Supreme Court of New Hampshire affirmed. Whether the flowing of plaintiff's farm was the cause of plaintiff's injury was properly a question for the jury. (Duss-Florida)
W71-05830

STATE V GUTHRIE (VALIDITY OF STATE PATENT TO ISLAND IN NAVIGABLE RIVER).
156 SW2d 210-215 (Ark 1941).

Descriptors: *Arkansas, *Islands, *Land tenure, *State governments, Navigable rivers, Real property, Proprietary power, High water mark, Rents, Navigable waters, Legal aspects, Judicial decisions, Administrative decisions, Adjudication procedure, Coal mines, Mining, Taxes.
Identifiers: Patents (Land).

Plaintiff state sued to set aside a deed, to recover an island held by defendant landowner, and to obtain an accounting for coal mined on the island. Plaintiff contended that the state land Commissioner had no authority to sell the island unless it was suitable for agriculture and above the mean high water mark of the river. Defendant contended that the land was both suitable for agriculture and above the high water mark. Reversing a judgment sustaining defendant's demurrer, the Supreme Court of Arkansas noted that although the land commissioner is presumed to have properly performed his duty under the law, plaintiff's contentions should have been accepted as true on demurrer since that presumption is not conclusive. The court also noted that equity would not allow plaintiff to recover the property or the profits therefrom without offering and paying a refund of defendant's purchase price, past taxes paid, and the cost of improvements. (Liptak-Florida)
W71-05831

STATE V QUATTROPANI (VALIDITY OF NO-BOATING ORDER TO PROTECT MUNICIPAL WATER SUPPLY).

133 A 352-355 (Vt 1926).

Descriptors: *Vermont, *Municipal water, *Boating regulations, *Water supply, Water quality control, Lakes, Ponds, Great ponds, Reasonable use, Riparian rights, Cities, Administrative agencies, Administrative decisions, Public rights, Public health, Potable water, Water quality, Water pollution, Water pollution sources, Water pollution control, Legislation, Boating, Regulation, Legal aspects, Adjudication procedure.

Respondent riparian owner was convicted of violating an order of the state board of health prohibiting boating on a pond which was used as a municipal water supply. Respondent contended that the order was void for lack of notice and as a taking of his riparian rights without compensation. The court af-

firmed the conviction and held that the only notice required was that of legislative publication, the board's order having the same effect. The court also noted that the order protecting the purity of the water supply was a reasonable exercise of state's police power and constituted a regulation, not a taking, of respondent's riparian rights and privileges. (Liptak-Florida)
W71-05832

NIES V BULKLEY (LIABILITY FOR BARGE COLLISION WITH SUBMERGED PILE).
104 Conn 382, 132 A 873-875 (1926).

Descriptors: *Connecticut, *Navigable rivers, *Boats, *Timber piles, Navigable waters, Rivers, Bridges, Bridge construction, Ships, Navigation, Piles (Foundations), Damages, Accidents, Engineering, Engineering structures, Transportation, Legal aspects, Judicial decisions, Adjudication procedure.

Plaintiff barge owner brought action against defendant bridge and highway commission to recover for damage to his barge caused when it ran into a submerged pile in a navigable river. Plaintiff contended that defendant had driven several temporary piles at the spot 14 years earlier in connection with the construction of a bridge and that the pile by which his barge was damaged was left in the river bed when the others were removed. Defendant contended that all their piles were 6 to 12 feet above the water and had been removed by the contractor under the supervision of the War Department engineer. The Supreme Court of Errors noted that whether the river was navigable at that spot and whether the War Department engineer properly performed his duties were questions for the jury, and that the trial judge improperly directed a verdict for defendant. However, the court affirmed the judgment for defendant and held that there was no evidence from which the jury could have found that the pile was one of the cluster driven by defendant at the spot 14 years prior to the accident. (Liptak-Florida)
W71-05833

STATE V ERWIN (TITLE TO ERODED LAND ON BED OF LAKE).
173 La 507, 138 So 84-92 (1931).

Descriptors: *Louisiana, *Ownership of beds, *Erosion, *Lakes, Navigable waters, High water mark, Accretion (Legal aspects), Shores, Beds, Boundaries (Property), Boundary disputes, Channels, Tides, Currents (Water), Rivers, Streams, Banks, Land tenure, Saline water, Fresh water, Legal aspects, Judicial decisions, Beds under water.

Plaintiff state of Louisiana brought suit to determine ownership of land which had by erosion become part of a lake. Plaintiff argued that the laws of accretion and dereliction applied and that defendants lost title to the land eroded away by the waves of the lake. Defendants contended that their title was good to the meander line established when Louisiana was admitted to the Union. The Supreme Court of Louisiana affirmed a judgment for defendants. The laws of accretion and dereliction do not apply to lakes. The lake in question was not merely a section of a navigable river. Thus, the state did not acquire title to the eroded land. One judge dissented on the grounds that the laws of accretion and dereliction do apply to lakes. On rehearing the court rejected the argument that the lake was an arm of the sea, although the lake was affected by the tides and was occasionally salty. If the lake had been found to have been an arm of the sea, adjoining lands which became part of the lake bed by erosion would belong to the public. (Duss-Florida)
W71-05834

KATZENBACH V ARMSTRONG CORK CO (CONSTRUCTION OF STATUTORY GRANT OF FILL RIGHTS IN NAVIGABLE RIVER).
132 A 324-325 (NJ Ch 1926).

Descriptors: *New Jersey, *River beds, *Landfills, *Legislation, Navigable rivers, Navigable waters, Delaware River, Tidal waters, Ownership of beds, Riparian rights, Riparian land, Riparian waters, Boundaries (Property), Boundary disputes, Reclamation, Land forming, Land development, Usufructuary right, Land tenure, Public lands, State governments, Cities, Legal aspects, Water law, Judicial decisions.

Plaintiff state sued to restrain defendant corporation from reclaiming and improving certain riparian and submerged land on the Delaware River. Plaintiff contended that defendant had no title to the land and would have to lease or purchase the land from the state. Defendant claimed title and the right to fill under a statute granting defendant's predecessor the right to fill and occupy any land fronting or adjoining its upland. The Court of Chancery of New Jersey noted that the special act granting fill privileges to defendant's predecessor should be strictly construed and considered revoked as to any land not already reclaimed or otherwise improved by the date of enactment of a later general act prohibiting reclamation of submerged tidewater land without the state's permission. Therefore, the court decreed in favor of plaintiff as to land not already reclaimed or improved at the passage of the subsequent general act. (Liptak-Florida)
W71-05835

6G. Ecologic Impact of Water Development

AN ENVIRONMENTAL SURVEY OF THE LOWER CLEARWATER RIVER,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W71-05336

TERRESTRIAL DESERT ARTHROPODS: FAUNA AND ECOLOGY,
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 02I.
W71-05478

ECOLOGIC AND ENVIRONMENTAL CONSIDERATIONS IN WATER RESOURCES MANAGEMENT,
Office of Water Resources Research, Washington, D.C.
Daniel L. Leedy.
In: Report on 5th Annual Water Resources Research Conference, Sponsored by the Office of Water Resources Research, Dept. of the Interior, Washington, DC, Feb 3-4, 1970, p 23-26.

Descriptors: *Environmental, *Ecology, Water policy, Planning, Coordination, Resource development, Future planning.
Identifiers: *Environmental problems, *Environmental quality, Water supply systems.

One of the significant trends in water and related resources fields in recent years has been the increased public awareness of environmental pollution. There is a definite need for scientists and ecologists to combine talents and direct their thinking to improving the environment. Expanding population adds other serious problems meeting increased water and recreational demands. In the future, there is an urgent need for more applied ecological research. (Wray-Chicago)
W71-05785

07. RESOURCES DATA

7A. Network Design

ROLE OF INFILTRATION IN NONLINEAR WATERSHED ANALYSIS PROCESSES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02A.
W71-05354

A PROPOSED STREAMFLOW DATA PROGRAM FOR MISSOURI,
Geological Survey, Rolla, Mo.
John Skelton, and Anthony Homyk.
Geological Survey Open-file report, 1970. 44 p, fig, 3 plate, 14 tab, 10 ref, append.

Descriptors: *Streamflow, *Hydrologic data, *Project planning, *Missouri, Evaluation, Data collections, Regression analysis, Water resources development, River basins, Watershed management, Flow characteristics, Channel morphology, Precipitation (Atmospheric), Topography, Vegetation, Gaging stations, Stream gages, Drainage, Soil properties.
Identifiers: *Streamflow data evaluation (Missouri).

The streamflow data program in Missouri is evaluated in order to design a network that will most efficiently produce the types of information needed for development of surface water resources in the state. The evaluation study has defined a program of streamflow data collection and analysis for current purposes, planning and design, monitoring of long-term trends, and definition of the stream environment. A regression analysis that used streamflow data from 225 continuous and partial-record gaging stations located in Missouri and adjoining states showed that, for ungaged sites on minor streams with drainage areas greater than 50 square miles, the following characteristics can be estimated within prescribed accuracy limits by regression equation: (1) mean flows, standard deviations of the annual means, low-order floods and flood volumes in the Plains region, (2) standard deviations of the annual means, high-order floods, and flood volumes in the Plateaus region, and (3) high-order floods and flood volumes in the Lowlands. A recommendation is made that 18 continuous-record stations be discontinued and that 10 be established. This will result in more substantive streamflow data plus significant economics in network operation. (Woodard-USGS)
W71-05369

A PROPOSED STREAMFLOW-DATA PROGRAM FOR IDAHO,
Geological Survey, Boise, Idaho.
C. A. Thomas, and W. A. Harenberg.
Geological Survey Open-file report, October 1970. 71 p, 2 fig, 12 tab, 12 ref, append.

Descriptors: *Streamflow, *Network design, *Data collections, *Idaho, Planning, Stream gages, Synoptic analysis, Assessments, Floods, Low flow, Stage-discharge relations, Surface-groundwater relationships, Instrumentation.

A streamflow information system is proposed, consisting of both data collection and analyses to efficiently provide the knowledge required for (1) current water use and management, (2) planning and design, (3) determination of long-term trends, and (4) assessment of stream environment. This proposal is the result of a study in which the basic steps were definition of long-term program goals, examination and evaluation of available data to determine which goals have been achieved, and consideration of alternate programs and techniques for meeting the remaining goals. Systematic collection of streamflow data began in 1889 with gaging stations on Bear River near Preston, Snake River at Idaho Falls, and Big Wood River at Hailey. Data

eeds for flood control, irrigation, hydroelectric ower, fish studies, recreational appraisals, naviga- ion, and waste disposal have resulted in operation f gaging stations at many places for various eriods. Program enlargements occurred in 1910, fter World War I, during the drought of the 930's, in 1943 for needs of a tri-state compact, nd during the early 1960's. In 1969 the Geological urvey streamflow data program was publishing aily records for streams, reservoirs, and major iversions at 252 continuous record sites and an- ual flood-peak data at 80 sites. Areas of inadequa- ies include data to define 100-yr floods, low-flow f small streams, seepage, return flows, and regula- ion. (Lang-USGS)
W71-05373

A PROPOSED STREAMFLOW DATA PROGRAM FOR MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 02E.
W71-05445

MONITORING CONCEPTS AND REQUIREMENTS IN COASTAL WASTES MANAGEMENT,
National Academy of Engineering, Washington, D.C.; and National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-05540

7B. Data Acquisition

FIELD TESTING OF THE IAEA PORTABLE RADIOISOTOPE SEDIMENT-CONCENTRATION GAUGE,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
W. B. Morrissey.
New Zealand Ministry of Works, Water and Soil Division Miscellaneous Hydrological Publication No 5, 1970. 17 p, 6 fig, 6 ref, 2 append. IAEA Contract 553/TC.

Descriptors: *Sediment discharge, *Suspended load, *Analytical techniques, *Evaluation, *Radioisotopes, Methodology, Testing, Test procedures, Sediment transport, Surface waters, Streams, Flow rates, Streamflow, Instrumentation, Remote sensing, Sediment yield, On-site investigations.
Identifiers: *Radioisotope sediment gage, *New Zealand.

The IAEA (International Atomic Energy Agency) sediment-concentration gage is described. The methods of carrying out the field calibrations by means of a conventional sampler, the DH-48, are summarized, and the calibration curve is shown. The maximum sediment concentrations encountered under natural conditions did not exceed 5,300 ppm, but sediment concentrations exceeding 50,000 ppm were artificially generated in the field. Limited testing for the effect of temperature change on the gage response showed that temperature was highly significant. Marked response to sea water appeared sufficient to preclude use of radioisotope methods in brackish waters. It is recommended that the inconsistencies of the IAEA probe when measuring low sediment concentrations be studied with the object of developing a more sensitive radioisotope sensing system. The low-energy X-radiation from the cadmium-109 source represents the end result of considerable research into the problem of lack of sensitivity of radioisotopes in low sediment concentrations. The supreme advantage of radioisotope sediment measurement is the elimination of the time and labor problems associated with the conventional sampling methods, and this advantage justifies the expense directed towards the development of greater reliability and sensitivity in radioisotope sediment-concentration gages. (Woodard-USGS)
W71-05352

SNOW SURVEY TECHNIQUES IN THE WAITAKI CATCHMENT, SOUTH CANTERBURY,
Ministry of Works, Timaru (New Zealand).
For primary bibliographic entry see Field 02C.
W71-05355

STREAM DISCHARGE ESTIMATION,
Forest and Range Experiment Station, Rangiora (Newland).
F. A. Johnson.
Journal of Hydrology (New Zealand), Vol 9, No 1, p 22-28, 1970. 7 p, 4 fig, 1 tab, 4 ref.

Descriptors: *Stream gages, *Discharge measurement, *Tracers, Electrical conductance, *Mixing, Discharge (Water), Streamflow, Electrolytes.
Identifiers: *Stream discharge estimation.

An electrically measured tracer method that minimizes the amount of field and laboratory work when measuring the three discharges at the junction of a main stream and a tributary is described. A comparison between discharges calculated from actual measurements and estimated from an electrical conductivity analysis is made. The dilution gaging technique to measure discharges upstream and downstream from the junction of a main stream and its tributary usually involves two discharge measurements and one estimation. The amount of field and laboratory work involved can be considerably reduced by making only one discharge measurement and using three electrical conductivity measurements to estimate the remaining two discharges. The technique is based on the injection of sodium dichromate solution at a constant rate, and the measurement of the subsequent dilution. (Knapp-USGS)
W71-05361

A HEATED ALPINE PRECIPITATION GAUGE,
Forest and Range Experiment Station, Rangiora (New Zealand).
C. L. Batcheler.
Journal of Hydrology (New Zealand), Vol 9, No 1, p 36-42, 1970. 7 p, 4 fig, 4 ref.

Descriptors: *Precipitation gages, *Snowfall, *Rain gages, Gaging stations, Data collections, Meteorological data, Instrumentation, Equipment, Precipitation (Atmospheric), Runoff forecasting.
Identifiers: *New Zealand.

A gage for measuring total precipitation at an alpine station, where most winter precipitation is snow, is described. The heating system in the gage employs an electro-mechanical device to control ignition and damping of a kerosene burner. Precipitation totaling 131 in., of which 37% was snow, was estimated for 1965 at an altitude of 4,700 ft. The recorded catch appears to be reasonably reliable. (Knapp-USGS)
W71-05363

POLLUTION, OCEANOLOGY AND LIMNOLOGY IN THE GREAT LAKES,
Northeastern Illinois State Coll., Chicago. Dept. of Geography.
For primary bibliographic entry see Field 02H.
W71-05398

DETERMINATION OF ORGANIC- AND CARBONATE-CARBON IN FRESHWATER LAKE SEDIMENTS BY A MICROCOMBUSTION PROCEDURE,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05A.
W71-05399

OCEAN OUTFALL DISPERSION,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05A.
W71-05521

INSTRUMENT TO MEASURE WEAK SEA CURRENTS,
Ente Nazionale per l'Energia Eletrrica. Cellole (Italy). Laboratorio Ricerche Ambientali Garigliano.
For primary bibliographic entry see Field 05B.
W71-05522

DETECTION OF OIL SLICK POLLUTION ON WATER SURFACES WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif.; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 05A.
W71-05533

OPTICAL (INFRARED AND ULTRAVIOLET-VISUAL) REMOTE SENSING OF POLLUTION OF WATER BODIES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05A.
W71-05538

MEASURING SOIL MATRIC POTENTIAL IN SITU BY SENSING HEAT DISSIPATION WITHIN A POROUS BODY: 1. THEORY AND SENSOR CONSTRUCTION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W71-05608

WATER-CO SUB 2 EXCHANGE SET-UP FOR THE ROUTINE 18-OXYGEN ASSAY OF NATURAL WATERS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
For primary bibliographic entry see Field 05A.
W71-05640

A ROTATING SAMPLING ARM--AN AID TO AUTOMATIC ANALYSIS OR SAMPLING,
Upper Tame Main Drainage Authority, Birmingham (England).
For primary bibliographic entry see Field 05A.
W71-05652

MEASURING DIRECTIONAL VELOCITY IN WATER WAVES WITH AN ACOUSTIC FLOWMETER,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W71-05656

TRACING SAND MOVEMENT IN THE LITTORAL ZONE: PROGRESS IN THE RADIOISOTOPIC SAND TRACER (RIST) STUDY - JULY 1968-FEBRUARY 1969,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-05657

MECHANICAL BEHAVIOR OF CONCERETE EXAMINED BY ULTRASONIC MEASUREMENTS,
Illinois Univ., Chicago.
For primary bibliographic entry see Field 08F.
W71-05723

COMPLETE ADJUSTMENT METHOD FOR ANALYZING ARCH DAMS,
COBA-CONSULPRESA, Lisbon (Portugal).
For primary bibliographic entry see Field 08A.
W71-05733

INFORMATION FOR DECISIONS IN ENVIRONMENTAL POLICY,
Library of Congress, Washington, D. C. Environmental Policy Div.
Richard A. Carpenter.
Science Vol 168, June 12, 1970, p 1316-1322. 1 tab, 3 ref.

Descriptors: *Environment, Political constraints, Ecology, Legislation, Federal government, *Decision-making.
Identifiers: *Environmental policy, Legislative Reference Service, Public policy.

The National Environment Policy Act of 1969 promises to be landmark legislation in stimulating ecological research. Rising public concern with better use of resources requires a historic and wrenching turn for both business and political processes. Three approaches to environmental quality and productivity are currently identifiable and important. The traditional approach is marketplace economics: determining costs of all aspects of a policy problem, in which a major difficulty is the quantification of long-term interests when economic theory discounts the future value of money. A second well-established viewpoint is that of human health. The powerful appeal of protecting health is useful in motivating social actions that are otherwise uneconomic. The third approach is that of ecology, for which it is difficult to quantify values. In order to legislate policy of protect and enhance the environment, the legislators must have technical information on which to base decisions. This information flows from all levels of society via diverse mechanisms, i.e., personal advisory groups, committee hearings, executive agencies, lobbies, etc. The Legislative Reference Service serves as a center for information; the Environmental Policy Division handles the information relating to environment. An important aspect in assisting Congress is to keep objective, technological questions separated from the political context. Ecologists, now gaining prominance in the environmental field, have a tremendous opportunity to influence policy through their participation in public affairs. (Wray-Chicago)
W71-05771

7C. Evaluation, Processing and Publication

SUMMARY OF GROUNDWATER HYDROLOGICAL DATA IN MICHIGAN FOR 1969,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 02F.
W71-05351

HYDROGEOLOGIC DATA FOR THE UPPER HOUSATONIC RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
Robert L. Melvin.
Geological Survey Open-file report, 1970. 33 p, 2 fig, 1 plate, 7 tab, 11 ref.

Descriptors: *Data collections, *Hydrologic data, *Connecticut, Water wells, Springs, Groundwater, Water levels, Aquifers, Glacial drift, Hydrogeology, Sediment, Sampling, Water resources, Water resources development.
Identifiers: *Aquifer tests, *Pumping tests, *Housatonic River Basin (Conn).

The upper Housatonic River basin covers an area of about 700 square miles in western Connecticut. Records of 284 wells and 5 springs, logs of 322 wells and test holes, mechanical analyses of 58 sediment samples of stratified drift and records of 3 pumping tests are contained in this report. The locations of all sites at which hydrogeologic data were collected are shown. The information is to be used with the companion interpretive report and should facilitate the development of water resources at specific localities. (Knapp-USGS)
W71-05357

A PROPOSED STREAMFLOW DATA PROGRAM FOR CENTRAL NEW ENGLAND,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 02E.
W71-05360

SURFACE WATER DATA - QUEBEC, WATER YEAR 1966.
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.

Translation of Annuaire Hydrologique - Quebec by Quebec Dept. of Natural Resources, Water Survey of Canada. Canada Dept of Energy, Mines and Resources, Inland Waters Branch Data Report: Information Canada, Ottawa, 1970. 339 p.

Descriptors: *Surface waters, *Hydrologic data, *Gaging stations, *Networks, *Data collections, Streamflow, Rivers, Lakes, Reservoirs, Dams, Powerplants, River basins, Discharge measurements, Water levels.
Identifiers: *Canada, Quebec, Hydrometric network.

To fulfill data needs for most of the Province of Quebec, this publication presents a compilation of available discharge and water level data for rivers and lakes for the 1966 water year. The hydrometric network, divided into three categories, consists of 351 stations, 41 of which were added in 1966. Of the 193 regular streamflow stations 6 were seasonal. There were 68 stations equipped with punched tape recorders, 91 with stylus-type recorders and 34 with manual gages. Of the 88 water level stations, 11 are crest gages, 22 are equipped with automatic recorders and 52 have a manual gage. There are 70 stations at dams, 42 at reservoirs and 28 at powerplants. This publication contains recorded water levels and computed discharges grouped by hydrographic regions. Eight small scale maps show the drainage patterns and location of streamflow and water level stations with numbers keyed to the data tables. Following the data tables is a numerical index that lists the stations which are shown in color on the maps. The index gives the number and name of the stations and page number on which the data are given. An alphabetical index to the report is given last. (Lang-USGS)
W71-05375

MATHEMATICAL MODEL OF RECALCINATION OF LIME SLUDGE WITH FLUIDIZED BED REACTORS,
General American Transportation Corp., Niles, Ill.
For primary bibliographic entry see Field 05D.
W71-05387

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 10. THE GREAT BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-05446

REPRESENTATIVE BASINS OF NEW ZEALAND-1970.
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02A.
W71-05448

BRIEF DESCRIPTIONS OF AND EXAMPLES OF OUTPUT FROM COMPUTER PROGRAMS DEVELOPED FOR USE WITH WATER DATA IN KANSAS,
Kansas Geological Survey, Lawrence.
Brent H. Lowell, Charles O. Morgan, and Jesse M. McNellis.
Available from NTIS as PB-194 969, $3.00 in paper copy, $0.95 in microfiche. Special Distribution Publication No 48, 1970. 61 p, 41 fig, 17 ref.
Identifiers: *Water supplies, *Kansas, *Hydrology, Statistical data, *Data processing systems, Digital computers, Geologic survey, Computer progra
Water wells, Mathematical logic, Coding, Err
Punched cards, Subroutines, Sedimentati
Chemical analysis, Quality control, Irrigat
systems, Ions, Statistical distributions, Fluid fl
*Computer graphics, Fortran 4 programming l
guage.

Programs written in FORTRAN IV language ha
been developed in the Kansas District of the U
Geological Survey to handle basic water data
use of the digital computer. The programs che
tabulate, graph, map, and statistically analyze d
derived from hydrologic and geologic investi
tions.
W71-05462

**DIGITAL SIMULATION MODEL OF INO
GANIC WATER QUALITY OF TAHO
TRUCKEE SYSTEM, NEVADA-CALIFORN
PROGRESS REPORT,**
Nevada Univ., Reno. Center for Water Resour
Research.
For primary bibliographic entry see Field 05G.
W71-05469

**AN APPROACH TO ACQUISITION AND HA
DLING OF SERIAL ENVIRONMENTAL DATA**
Westinghouse Ocean Research Lab., San Dieg
Calif.
A. Kirst, Jr., and R. W. Onstenk.
1970 IEEE International Conference on Enginee
ing in the Ocean Environment, Panama Cit
Florida, September 21-24, 1970, Digest of Techn
cal Papers, p 51-53.

Descriptors: *Wastes, *Management, *Enviro
mental gradient, *Coasts, *Instrumentation, *Da
collections, *Computers, *Monitoring, Cost
Design criteria, On-site tests.
Identifiers: California, Florida, Sensors.

Attention has recently been focused on manag
ment programs for coastal waste control.
thorough understanding of the environmen
parameters operating in the coastal zone led to th
acquisition of instrument systems to measure suc
parameters, their spatial and temporal variation
and their interrelationships. A procedure for th
design and integration of such systems and two ex
amples are presented. (Ensign-PAI)
W71-05537

**FLOODS ON NAPA RIVER AT NAPA
CALIFORNIA,**
Geological Survey, Washington, D.C.
J. T. Limerinos.
For sale by U.S. Geological Survey, Washington
D.C. 20242 - price 75 cents. Geological Surve
Hydrologic Investigations Atlas HA-348, 1 sheet
1970. Text, 3 fig, 1 map, 2 photo, 1 tab, 6 ref.

Descriptors: *Floods, *Surface waters, *Stream
flow, *Flood plains, *California, Gaging station
Runoff, Discharge measurement, Hydrologic data
Flow measurement, Flow rates, Watershed
(Basins), Peak discharge, Stage-discharge rela
tions, Flow profiles.
Identifiers: *Hydrologic Atlas, *Napa River (Napa
Calif), Flood frequency, Flood profiles.

This atlas summarizes the results of an investigation
of the floodflow characteristics of the Napa River
in the vicinity of Napa, Calif. The approximate
areas inundated during the floods of February 27
1940, and December 22, 1955, are shown on the
map to record past floods and to aid in estimating
future flood risk. The drainage area upstream from
the Geological Survey stream-gaging station Napa
River near Napa, near the north limit of the flood
inundation map, is about two square miles. The
principal tributaries--Conn, Dry, Milliken, and
Redwood Creeks--enter the Napa River in the 10
mile reach upstream from Napa. Within the study
area, Soda, Tulucay, and Milliken Creeks enter
from the east and Napa Creek enters from the west.

ther illustrations and tables show major floods, lood discharges, flood frequencies, flood profiles, nd aerial views of flooding in the Napa area. Woodard-USGS)
W71-05559

COMPUTER SIMULATION MODEL OF EDIMENTATION IN A SALT WEDGE ESTUA-RY,
heffield Univ. (England). Dept. of Geology.
or primary bibliographic entry see Field 02L.
W71-05586

EXTENDING THE RECORD ON THE TEME,
irmingham Univ. (England). Dept. of Civil En-ineering.
M. J. Hamlin, and N. T. Kottegoda.
ournal of Hydrology, Vol 12, No 2, p 100-116, anuary 1971. 17 p, 7 fig, 5 tab, 11 ref.

escriptors: *Data collections, *Synthetic hydrolo-y, *Streamflow forecasting, *Correlation analysis, imulation analysis, Variability, Water yield, Ru-off forecasting, Probability.
dentifiers: *Teme River (England).

As the length of record of the Teme River, En-land, is insufficient for the prediction of the haracteristics of future water supplies by means of data generation, a comparison was made to the 47 year old record of the Severn at Bewdley. High cor-elation was found between the flows at the two sta-ions. This coefficient together with the serial cor-elation coefficients, the means, variances, and probability distributions at each site were used in a bivariate model for generating synthetic river flow sequences, the relevance of which were checked by statistical tests. The main purpose of the model, to generate critical values and sequences having a greater range than those found in the historical trace, was achieved. Reservoir storages for varying design periods, probabilities of non-exceedance, and draft rates are obtained through a modified Stall method. (Knapp-USGS)
W71-05589

A PROPOSED TECHNIQUE FOR IDENTIFICATION OF UNCONFINED AQUIFER PARAMETERS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 02F.
W71-05591

RAPLOT II - COMPUTER PROGRAM FOR DATA PROCESSING AND GRAPHICAL DISPLAY FOR RADIOISOTOPIC SAND TRACER STUDY,
Army Coastal Engineering Research Center, Washington, D.C.
Philip A. Turner.
CERC Miscellaneous Paper 3-70, May 70. 66 p, 10 ref.

Descriptors: *Computer programs, *Oceanography, Continental shelf.
Identifiers: *Dynamic oceanography, *Radioisotopic sand tracer, Hydrographic survey.

RAPLOT II is a computer program for processing radiation and navigation data from field surveys of radioisotopic sand tracer (RIST) study, but is applicable to any survey type operation on the nearshore Continental Shelf. Collected data are punched onto paper tape by the data collection computer on the research vessel. The data are later transferred to magnetic tape which provides the input for the RAPLOT II Program. Program control parameters are on punched cards. The navigation data, which consists of ranges to two shore-based radar beacons, are first edited for spurious data, and then converted to rectangular coordinates (in this case the California Lambert Coordinate System). Radiation data are converted to count rate as counts per second. Background count rate is computed and subtracted from the observed count rate, and any radiation counts that are significantly above the background count rate are corrected for time of decay since the isotope was injected. Output from the program is in three forms - printed output, graphical output, and magnetic tape record. The processed data are transferred to magnetic tape and made available for further processing, such as the generation of contour maps. (CERC)
W71-05658

AN EXPERIMENT IN FINITE-DIFFERENCE WATERSHED MODELING,
Montana Univ., Boziman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W71-05701

SIMULATION VIA TIME-PARTITIONED LINEAR PROGRAMMING: A GROUND AND SURFACE WATER ALLOCATION MODEL FOR THE GALLATIN VALLEY OF MONTANA,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 02A.
W71-05716

08. ENGINEERING WORKS

8A. Structures

EXPERIMENTAL DUNES OF THE TEXAS COAST,
Army Coastal Engineering Research Center, Washington, D.C.
Bard O. Gage.
CERC Miscellaneous Paper 1-70, Jan 70. 33 p.

Descriptors: *Shore protection, *Dunes, Texas.
Identifiers: Barrier Islands, Snow fences, Beach grass, Junk car bodies.

Storms and increased habitation on barrier islands have reduced the height and width of dunes on the Texas Coast, thereby exposing it to the surges and waves produced by tropical storms in the Gulf of Mexico. This publication reports on experimental means of creating and stabilizing sand dunes to protect the coast. Four locations were selected; the SW end of Galveston Island, Packery Channel, Newport Pass on North Padre Island and Corpus Christi Pass. Low areas of the barrier islands were planted in various types of vegetative cover in an attempt to establish dunes without the aid of sand fences. Snow fencing was used to accumulate wind-blown sand and vegetative planting made to stabilize dunes. Junk car bodies were placed in line parallel to beaches and used instead of more conventional means to establish and stabilize dunes by trapping sand. Since snow fences are more effective and much cheaper junk cars are not recommended for building dunes.
W71-05660

BULLETIN AND SUMMARY OF RESEARCH PROGRESS, FISCAL YEARS 1967-69.
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W71-05662

FOAM AGENTS AND FOAM DRILLING,
Jersey Production Research Co., Tulsa.
A. S. Murray, and J. E. Eckel.
Oil and Gas Journal February 20, 1961. Reprint, 4 p.

Descriptors: *Drilling fluids, Muds, *Drilling, Rotary drilling, Drilling equipment, Oil industry.
Identifiers: *Foam drilling, Air drilling, Mist drilling, Formation water, Foam injection, Cuttings.

Foam drilling is only one modification of air drilling, but its importance is growing. Successful foam drilling depends on an efficient foaming agent-one that has the properties needed to get the job done. This article deals with these requirements of a foaming agent, and other aspects of foam drilling. From experience, operators realize that air drilling in general has these advantages: (1) improved definition of stratigraphy and structure, (2) more and usually better well data, and (3) two to ten times the penetration rate and bit life. Dry formations are usually drilled with only air as a circulation medium. But when other conditions are present, the drilling fluid must be modified in these ways: (1) Foam drilling is used to penetrate competent water-bearing formations, (2) aeration drilling is used to penetrate less-competent formations that can be drilled with foam, and to lift large flows of formation water, and (3) chemicals are used to shut off flows from water-bearing formations. (Campbell-NWWA)
W71-05685

MUD KNOW-HOW HELPS EXPLORATION DRILLING,
National Lead Co., Houston, Tex., Baroid Div.
George R. Gray.
Mining in Canada, May and June, 1970. Reprint, 6 p.

Descriptors: *Drilling fluids, Muds, Drilling, Mining, Water wells, Rotary drilling, Core drilling.
Identifiers: *Drilling fluid function, Density, Flow properties, Gel development, Filtration properties, 'Bad ground', Wall-stuck rods, Lost circulation, Mud technology.

Modern drilling fluids technology is making substantial contributions to mineral exploration through reduction in time spent in coring, and improvement in core recovery. Both factors have become increasingly important in recent years because labor is a major item in the cost of exploratory drilling and increase in footage per shift is significant. The enormous capital investment needed to develop low-grade ores requires full information on the prospect; hence, the demand for complete core recovery. The mud should be used as a tool, not as a last resort when the situation otherwise appears hopeless. In the minds of many drillers 'mud' is associated only with 'trouble'. This attitude is not sensible. Mud should be employed as a device to avoid hole problems. Satisfactory performance of the drilling fluid depends on the conditions of use. The drill tools and the driller's skills, as well as the rocks drilled, significantly affect the success of the mud program. There is no more an all-purpose drilling fluid than there is an all-purpose diamond bit. Recognition of the limitations and capabilities of the personnel, the equipment, and the drilling fluid is essential to the effective planning of a coring program. (Campbell-NWWA)
W71-05686

ECONOMICS OF PERCUSSION VERSUS AIR ROTARY DRILLING,
Mission Mfg. Co., Houston, Tex.
Robert E. Bates, Jr.
World Oil, February 1, 1965. 9 p, 11 fig.

Descriptors: *Drilling, *Oil industry, Rotary drilling, Drilling equipment.
Identifiers: *Percussion rotary drilling, Air rotary drilling, Kinetic energy, Percussion bit life, Drilling rate.

Percussion drilling tools and technique are gaining acceptance and moving out of specialty application. The extremely rapid hammer blows - delivered with relatively light weight-on-bit-increase bit life, decrease drill collar wear and help control deviation while maintaining penetration rates. The technique is limited, however, to systems using circulating fluids which are compressible, such as air, natural gas and foam (mist). Percussion rotary drilling is the rotary technique in which the main source of energy for fracturing rock is obtained from a percussion machine connected

directly to the bit. The circulating system, drill string and hoisting system are unchanged from that used in the conventional air rotary method. Field performance results and cost-analysis nomographs determine when to consider using percussion drill. (Campbell-NWWA)
W71-05687

TELEVISION INSPECTION OF A GRAVEL PACK WELL,
Madison Water Utility, Wis.
For primary bibliographic entry see Field 04B.
W71-05695

OIL FIELD TECHNIQUES USEFUL IN WATER WELL DRILLING,
Southern California Water Co., Santa Barbara.
Harvey A. Mylander.
Water Well Journal, Reprint from Nov-Dec 1955, Jan 1956, and March 1956, 11 p, 17 fig, 2 tab, 8 ref.

Descriptors: *Rotary drilling, *Logging (Recording), Electrical well logging, Radioactive well logging.
Identifiers: *Pilot bore, Magna-Tector, Jet casing cutter, Bottom hole jet cutter, Temperative surveys, Pressure surveys, Flow surveys, Projectile perforating, Pneumatic well seal, Typical well completion costs, *Single-Shot Photographic Drift Indicator, *Multiple-Shot-Photographic Drift and Directional Indicator.

This article summarizes briefly some of the more useful oil field techniques that are fully developed and readily available for water well use. Pilot holes are usually drilled, then reamed to final diameter, in one or more passes. After the well bore is completed the casing is lowered into place and the space between is often packed with gravel. Early in the development of rotary drilling, it was evident that holes started straight at the surface but did not continue to be vertical as the bit penetrated steeply dipping beds of different hardnesses. The instruments used to determine drift and direction may be classed as (1) single-shot or (2) multiple-shot. Other instruments, such as electrical and radioactive logging are also of considerable use. Caliper instruments which measure hole diameter find common use for (1) determining intervals of significant caving (2) calculating the quantity of gravel necessary to properly gravel-pack the hole behind casing and (3) picking sections suitable for locating centering devices for the casing within the well bore. The Magna-Tector is a down-hole tool for locating the point at which pipe is stuck in a well, or the lowest point that it is free. Jet casing cutter and a bottom hole jet cutter also finds some application in alleviating stuck drill pipes and bits. Pneumatic well seals and charged perforating devices aid in converting abandoned oil wells to water wells. (Campbell-NWWA)
W71-05696

OIL WELL DRILLING TECHNOLOGY,
Arthur W. McCray, and Frank W. Cole.
University of Oklahoma Press, Norman, 1958. 492 p, 76 ref.

Descriptors: *Drilling, *Oil industry, Drilling equipment, Rotary drilling, Rock properties, Coring, Permeability, Geophysical methods, Geochemistry, Casing, Drilling fluids, Cements, Oil wells, Radioactive logging, Electrical logging, Logging (Recording).
Identifiers: *Petroleum reservoirs, Well planning, Power plants, Rotary operations, Drill strings, Drill bits, Hoisting operations, Drilling practices, Fishing tools, Formation evaluation, Pressure surges, Pressure anomalies, Casing design, Cementing operations, Drilling economics.

This book is the product of extensive research and practical investigation and is a comprehensive presentation of the procedures identified with this complex subject. It presents a thorough technical discussion of the geological and geophysical principles governing oil accumulation and the drilling of wells from the standpoint of the driller, petroleum engineers, geologist, and student. From a survey of the geological formations likely to contain deposits of oil, it proceeds to methods of discovery, including some radioactive prospecting methods, then to the various types of drilling and drilling tools, to cementing operations, and to costs and ways of paying drilling charges. Practical problems are posed and methods of solving them demonstrated. Graphs, charts, and figures are used freely, along with illustrations of many types of equipment, to aid the driller in visualizing the solution of problems. The experience oilman can find practical answers to many of his problems and questions, the student a sound text for basic principles of oil well drilling. The text provides a complete information on drilling techniques, whether the well is 100 or 20,000 feet deep. (Campbell-NWWA)
W71-05698

MASTER LIBRARY OF WATER WELL EQUIPMENT AND MAINTENANCE DATA,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 08G.
W71-05700

COLORADO RIVER FRONT WORK AND LEVEE SYSTEM--HYDRAULIC MODEL STUDIES FOR DEVELOPMENT OF MIXING AND RATING STRUCTURES--DELIVERY OF WATER TO MEXICO, A FEASIBILITY INVESTIGATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08B.
W71-05722

DAM FAILURES: AN ASSESSMENT,
Resources Research Centre, Ottawa (Ontario).
A. K. Biswas, and S. Chatterjee.
Pap, Annu Meet Eng Inst Can, Ottawa, Can, Sept 1970. 28 p, 2 tab, 45 ref.

Descriptors: *Dam failures, *Damages, Dams, Disasters, *Concrete dams, *Earth dams, Spillway design flood, Dam foundations, Statistics, Floods, Safety, Reservoirs, Earthquakes, Investigations, Sliding, Landslides, Bibliographies, Operation and maintenance, Warning systems, Foreign.
Identifiers: Research, Dam stability, Overtopping, Spillway capacity, Canada.

Large dams and reservoirs create a complex new environment, and very little is known about the mutual interactions of the component forces to keep the newly created man-imposed systems and nature in a proper equilibrium on a long-term basis. Dams, like other structures, are subject to decay and deterioration with the passage of time and do fail occasionally. Many lessons can be learned from the study of dam failures. Several case studies of failures and disasters involving dams and reservoirs are presented. Careful analyses of more than 300 dams from all over the world indicate that: 35% of the failures are caused by exceedance of the spillway design floods; 25% are caused by foundation problems; and the remaining 40% have various causes such as improper design and construction, improper operation and maintenance, use of inferior-quality materials, and ice and wave action. Has 45 references. (USBR)
W71-05725

USBR VIBRATION TEST SYSTEM,
Bureau of Reclamation, Denver, Colo.
R. M. McCafferty.
Pap, 41st Shock Vib Symp, Air Force Acad, Colo Springs, Colo, Oct 1970. 9 p, 8 fig, 1 tab, 2 ref.

Descriptors: Seismic investigations, Research and development, Test procedures, *Seismic studies, *Test facilities, *Test equipment, Shock tests, Instrumentation, Frequency, Resonance, *Structural behavior, Structural engineering, Failu
Earthquake engineering, Dynamic tests, Dyna
response, Dynamic loads, *Vibration tests.
Identifiers: Vibration exciters.

The electrohydraulic vibration test system of
Bureau of Reclamation is described. The test
facility, testing equipment, control equipment,
strumentation, and analysis equipment of
system are discussed, and testing and analy
methods used on the present testing program
described. The system is used primarily for det
mining the structural response of reinforc
concrete specimens. Programs are being co
sidered for other dynamic problems such as str
ture-foundation interaction, hydrodynamic effec
dynamic material properties, and response of st
structures. The vibration test system is capable
testing a wide variety of specimens from very sm
to quite large masses, the upper limit of specim
size being restricted only by available space or
exciter rating. (USBR)
W71-05727

**RESEARCH PROGRAMS ON PIPELIN
CROSSINGS,**
El Paso Natural Gas Co., Tex.
W. F. Quinn.
Proc Amer Soc Civ Eng, Transp Eng J ASCE, V
96, No TE3, p 283-290, Aug 1970. 8 p, 5 tab,
ref, 2 append.

Descriptors: *Pipelines, *Railroads, *Highwa
*Crossings, Design standards, *Dead loads, *Li
loads, Stress, Investigations, Resarch and develo
ment, Deflection, Elastic deformation, *Loa
(Forces), Bibliographies, Casings, Behavior, B
ried pipes, Test results.
Identifiers: *Deflection measurement.

A history and summary report concerning the a
tivities of the American Society of Civil Engine
Research Council on Pipeline Crossings of Ra
roads and Highways is given. The council w
created to substantiate certain theories to be us
in the design criteria for cased and uncas
pipeline crossings. The areas placed under i
vestigation dealt with the physical performance
pipelines subjected to suface loadings, stress
resulting from external loadings and internal pre
sure, forces acting on a buried pipeline resulti
from static and dynamic loadings, and the effect
passive resistance through soil support reactio
The three basic phases of the research progra
are: (1) field casing investigations; (2) passive so
resistance investigations; and (3) laboratory i
vestigations on 8-, 12-, and 24-in. pipelines. Has 2
references. (USBR)
W71-05728

**DESIGN, CONSTRUCTION, AND PE
FORMANCE OF CELLULAR COFFERDAMS,**
Woodward-Clyde and Associates, Inc., New Yor
and Cornell Univ., Ithaca, N.Y.
Y. Lacroix, M. I. Esrig, and U. Luscher.
Lateral Stresses Ground Design Earth-Retainin
Struct, 1970, Spec Conf, Cornell Univ, Ithaca, N
p 271-328, June 1970. 58 p, 18 fig, 1 tab, 29 ref.

Descriptors: *Cofferdams, Cellular structure
Cells, Dams, Fills, Retaining walls, Design criteri
Construction materials, Theory, Pile driving, Co
struction, Performance, Safety factors, Earth pre
sure, Sheet piling, Stability, Foundations, Por
pressure, Seepage, Design, Bibliographies, Co
struction methods, Design practices.
Identifiers: *Cellular cofferdams, Empiric
methods.

First developed as a temporary structure to exclud
water from excavations, cellular cofferdams ar
being used as temporary and permanent structure
to retain soil, water, or both. Cellular cofferdam
are used in lieu of earth or rockfill cofferdam
when the width of the structure must be smal
when a vertical face is required, or when stabilit
against scour is required. Design theories, signifi

cant design and construction considerations, and performance of cellular dams are reviewed. Cellular cofferdams normally are double-wall retaining structures constructed of interlocking steel sheet piles forming adjacent cells that are filled with soil or rock fragments. Common shapes of cells are circular, diaphragm, and cloverleaf. Cells may be arranged along straight lines or lines having uniform or variable curvatures. High cellular cofferdams may be provided with a berm on the unloaded side to increase stability. A berm of riprap may be provided on the water side to protect against scour. Cellular cofferdams are founded on rock where possible, and cell fill should be a face-draining cohesionless soil; however, many are founded on soil, and some cell fills of rather impervious cohesive soil have performed satisfactorily. Has 29 references. (USBR)
W71-05731

COMPLETE ADJUSTMENT METHOD FOR ANALYZING ARCH DAMS,
COBA-CONSULPRESA, Lisbon (Portugal).
J. L. Serafim.
Proc Amer Soc Civ Eng, J Struct Div, Vol 96, No ST8, p 1711-1734, Aug 1970. 24 p, 15 fig, 17 ref, 2 append.

Descriptors: Dams, *Concrete dams, *Arch dams, *Dam design, Arches, *Analytical techniques, Foreign design practices, Bibliographies, Shell structures, Displacements, Deformation, Stress analysis, Structural analysis, Stress, Cantilevers, Thin arch dams, Computer applications, Matrix methods (Structural), Double-curvature arch dams.
Identifiers: Shell theory, Portugal.

The method assumes the arch dam to be divided into 2 systems--arches and cantilevers--formed by voussoirs (elements). In the voussoirs at the crossing of arches and cantilevers, all internal forces and external loads are considered and the complete set of equations of equilibrium is established. Also considered are the 3 components of linear displacements and the 6 rotations of the normals to the faces. For continuity and equilibrium of shear stresses, torsions of the horizontal and vertical axes are not independent and vertical and tangential displacements must be taken simultaneously. Internal forces are obtained by solving a system of equations of compatibility which express equal displacements at the crossing of arches and cantilevers. Both systems of elements are analyzed for triangular unit loads, for which the coefficient of influence of the various displacements are determined. The method presents a matrix formulation for the arches and a general formula for the cantilevers. Results obtained for 2 test dams using the method show excellent agreement with results of numerical methods developed in Great Britain. Comparing results of model tests for 5 double-curvature arch dams indicates that the method is one of the more exact. Has 17 references. (USBR)
W71-05733

INFLUENCE ON THE BEHAVIOUR OF AN ARCH DAM OF THE HYDROSTATIC PRESSURE ON THE GROUT CURTAIN AND OF THE STRESSES IN THE GROUND UPSTREAM,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
M. Rocha.
10th Int Congr Large Dams, Montreal, Can, Vol 4, Quest No 39, p 541-558, June 1970. 18 p, 16 fig, 4 ref.

Descriptors: *Concrete dams, Arch dams, Dam design, Dams, Stress, Dam foundations, *Structural behavior, *Hydrostatic pressure, Grout curtains, Tensile stress, Displacements, Cracks, Model tests, *Model studies, Effects, Foreign research, Design criteria, Mathematical analysis, Test procedures, Design practices.
Identifiers: Foundation models, Portugal.

Two phenomena usually not taken into account in the design of concrete dams are: (1) tensile stresses in the foundation rock upstream from the dam caused by downstream displacements of the dam under hydrostatic pressure; and (2) the influence of the action of hydrostatic pressure on the grout curtain. Model studies to determine the influence of these phenomena show that loading of a dam develops tensile stresses in the upstream foundation that can produce cracks when the stresses are not offset by a pre-existing compressive state of stress. The foundation cracks may influence the state of stress in the lower upstream zone of the dam. The influence can be considerable when the design is affected by tensile stresses in the upstream toe of the dam. The action of hydrostatic pressure on the grout curtain induces non-negligible stresses in the dam which usually improves the state of stress caused by hydrostatic pressure on the dam. (USBR)
W71-05734

8B. Hydraulics

RESPONSE OF OFFSHORE STRUCTURES TO RANDOM WAVE FORCES,
California Univ., Berkeley. Dept. of Structural Engineering.
Anil K. Malhotra, and Joseph Penzien.
ASCE Proceedings, Journal of the Structural Division, Vol 96, No ST10, p 2155-2173, October 1970. 19 p, 12 fig, 1 tab, 16 ref, 2 append.

Descriptors: *Waves (Water), *Offshore platforms, *Structural behavior, *Structural design, Structural stability, Design, Towers, Structural analysis, Deflection, Stress analysis, Structural engineering.
Identifiers: *Offshore structures, *Wave forces.

The structural response of towers in deep waters can be reasonably well estimated through a statistical approach which assumes sea flow conditions as stationary gaussian processes by the one-dimensional wave height spectrum and Airy's linear wave theory. Extreme value statistics enable computation of the most probable peak values of the structural response. The response of a tower can be represented fairly accurately by considering only the first two or three lateral modes of vibration. It is desirable to set the leg spacing for the tower in the region of half the wave length, corresponding to the peak frequency of the wave height spectra. As this peak frequency is a function of the wind velocity, a number of alternative critical velocities may have to be examined. A symmetrical structure subjected to symmetrical flow will not experience cross drag inertial forces; thus, no torsional stresses will be introduced. However, due to eccentricities and cross flow, torsional stresses will be introduced and should be checked. These stresses can be significant when the first torsional mode and the first bending mode have frequencies which are close together. (Knapp-USGS)
W71-05368

HYDRAULIC TESTING OF HOLE UAe-7h, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
Wilbur C. Ballance.
Available from NTIS, Springfield, Va 22151 - Price $3.00 printed copy; $0.65 microfiche. Geological Survey Report USGS-474-484, 1970. 35 p, 15 fig, 1 tab, 2 ref. USAEC Agreement No AT (29-2)-474.

Descriptors: *Groundwater movement, *Hydraulic gradient, *Drill holes, *Water yield, *Alaska, Aquifers, Drawdown, Injection wells, Test procedures, Pumping, Specific capacity, Water levels, Transmissivity, Hydraulic conductivity, Velocity.
Identifiers: *Underground chamber, Swabbing recovery test.

Hole UAe-7h was hydraulically tested in support of the U.S. Atomic Energy Commission's underground nuclear testing program on Amchitka Island, Alaska. Five zones were tested by isolating them with straddle packers. Water bypass around the packers occurred during two of the tests. Because of unstable borehole-wall conditions, favorable locations for setting packers were scarce. The hole was drilled into an intrusive contact zone consisting of highly fractured, hydrothermally altered andesites, metamorphosed breccias, hornfels, and intities. The hole was very difficult to drill because the fractured rock constantly caved from the hole wall and considerable time was required to clean the caved material from the hole. The constant caving resulted in an enlarged borehole often beyond the capacity of the packers to expand. The relative specific capacity (computed from injection test data) of the tested intervals ranges from 0.65 to 1.94 cubic meters per day per meter (0.037 to 0.109 gallons per minute per foot) of drawdown. (Woodard-USGS)
W71-05371

FLOOD ROUTING THROUGH STORM DRAINS: PART IV - NUMERICAL COMPUTER METHODS OF SOLUTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich, and A. H. Barnes.
Colorado State University Hydrology Paper No 46, November 1970. 47 p, 16 fig, 4 tab, 6 ref, 3 append. Bureau of Public Roads supported.

Descriptors: *Computer programs, *Flood routing, *Storm drains, *Numerical analysis, Mathematical studies, Routing, Equations, Unsteady flow, Mathematical models, Waves (Water), Critical flow, Supercritical flow, Flow, Storm runoff.
Identifiers: Storm drain flow routing.

Computer-oriented numerical methods are given for solving the Saint-Venant quasi-linear hyperbolic partial differential equations of gradually varied free-surface unsteady flow for storm drains. Various numerical finite-difference schemes, including explicit schemes based on the two partial differential equations, unstable diffusing, upstream differencing, leap frog, Lax-Wendroff, and the specified intervals scheme are analyzed. The specified intervals scheme (derived from the method of characteristics), the Lax-Wendroff scheme, and the diffusing scheme are compared. Flow charts and computer programs for these various numerical methods are given. (Knapp-USGS)
W71-05376

PROCEDURE FOR COMPUTING THE ELASTIC SEEPAGE REGIME IN CONFINED AQUIFERS,
S. N. Numerov, and R. M. Barsegyan.
TT-55062. Available from NTIS. Translation of Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhniki, Vol 86, p 48-59, 1968. Transactions of the Vedeneev All-Union Scientific Research Institute of Hydraulic Engineering, Vol 86, p 43-54, Israel Program for Scientific Translations 1970. 12 p, 4 fig, 1 tab, 5 ref.

Descriptors: *Groundwater movement, *Confined water, *Aquifers, *Darcys law, *Elasticity (Mechanical), Permeability, Transmissivity, Aquicludes, Compressibility, Percolation, Seepage.
Identifiers: *Elastic seepage.

A procedure is given for computing nonsteady seepage, according to Darcy's law, of groundwater in confined aquifers when the elasticitics of the liquid, and low-permeability strata are taken into account. It is assumed that the low-permeability stratum is homogeneous, and that the permeabilities of the aquifers vary only in the vertical direction. The following assumptions are made: (1) seepage in the low-permeability stratum is vertical; (2) the piezometric heads in the aquifers are constant in the vertical direction. (Knapp-USGS)
W71-05455

SOLUTION OF A BOUNDARY VALUE PROBLEM OF NONSTEADY SMOOTHLY VARYING FLOW OF A LIQUID BY THE IMPLICIT FINITE-DIFFERENCE METHOD,
A. I. Fedorenkov.
TT-55062. Available from NTIS. Translation of Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhniki, Vol 86, p 127-133, 1968. Transactions of the Vedeneev All-Union Scientific Research Institute of Hydraulic Engineering, Vol 86, p 121-127, Israel Program for Scientific Translations 1970. 7 p, 2 fig, 3 ref.

Descriptors: *Open channel flow, *Numerical analysis, *Unsteady flow, Mathematical studies, Equations, Linear programming, Boundary processes.
Identifiers: Samt-Venant equation.

An implicit finite-difference method is presented for solving the boundary-value program for Saint-Venant's equation, which describes nonsteady smoothly varying open-channel flow. The derivatives along the flow, are replaced by symmetric finite-difference ratios at interior points of the stretch considered, and by finite-difference equations. (Knapp-USGS)
W71-05457

FINITE-DIFFERENCE SCHEMES COMPARED FOR WAVE-DEFORMATION CHARACTERISTICS IN MATHEMATICAL MODELING OF TWO-DIMENSIONAL LONG-WAVE PROPAGATION,
Army Coastal Engineering Research Center, Washington, D.C.
R. J. Sobey.
CERC Technical Memorandum No 32, Nov 70. 36 p, 5 ref.

Descriptors: *Waves, *Mathematical models, *Tides.
Identifiers: Long waves, *Wave propagation, Finite-difference schemes, *Storm surge, Tides.

The wave-deformation characteristics of several difference schemes for two-dimensional long-wave propagation are compared by means of the propagation factor introduced by J. J. Leendertse. The schemes compared are those proposed by N. S. Heaps, R. O. Reid and B. R. Bodine, J. J. Leendertse, and M. B. Abbott, respectively. The study also demonstrates the differing behavior of explicity and implicit schemes. (CERC)
W71-05654

MEASURING DIRECTIONAL VELOCITY IN WATER WAVES WITH AN ACOUSTIC FLOWMETER,
Army Coastal Engineering Research Center, Washington, D.C.
R. H. Multer.
CERC Technical Memorandum No 31, Apr 70. 27 p.

Descriptors: *Oceanography, *Instrumentation, *Waves, *Flowmeters.
Identifiers: Dynamic oceanography, Wave-direction sensor, Acoustic flowmeter.

This report contains the technical details of an investigation which was undertaken to adapt an acoustical flowmeter to a device for measuring velocities in water-wave phenomena. The flowmeter studied was designed to measure the difference in travel times of two acoustical pulses traveling simultaneously in opposite directions along a common path. Because of viscous effects, a zone of low velocity flow occurs behind each probe and the measured velocity is somewhat less than the actual velocity when the angle between the acoustical path and velocity vector, theta, is small. When this angle is relatively large, the wake has little effect on the velocity and V measured — V actual x cos theta. It is shown in this report that the wake effect may be eliminated by making simultaneous measurements along multiple paths. (CERC)
W71-05656

CERC WAVE GAGES,
Army Coastal Engineering Research Center, Washington, D.C.
Leo C. Williams.
CERC Technical Report No 30, Dec 1969. 124 p.

Descriptors: *Ocean waves, *Instrumentation.
Identifiers: Ocean-wave gages, Oceanographic instrumentation, Step-resistance wave gages, Strip-chart wave records, Wave-record analyzer (Magnetic tape).

CERC has used wave gages to gather prototype wave data since 1948. Two basic types of gages are now used in the field - the step-resistance staff gage and the underwater pressure-sensitive gage. CERC has developed three types of step-resistance staff gages - a series type for use in fresh water, a parallel type for use in salt water, and a relay-operated type for use in either fresh or salt water or in water where wide changes in salinity occur. The pressure gage can be used in water of any salinity. The series and parallel gages have an accuracy of plus or minus 5 percent plus the spacing of one sensor increment. The relay gage has an accuracy of plus or minus 2 percent plus the spacing of one sensor increment. The accuracy of the pressure-sensitive gage is not as precise as that of the step-resistance gages. The report describes each gage and the theory of operation, details of fabrication, steps for calibration and installation, and requirements of maintenance. (CERC)
W71-05659

BULLETIN AND SUMMARY OF RESEARCH PROGRESS, FISCAL YEARS 1967-69.
Army Coastal Engineering Research Center, Washington, D.C.

CERC Bulletin III, July 1970. 72 p.

Descriptors: *Coastal engineering, Shore protection, *Riprap, Ecology, *Beach erosion.
Identifiers: Shore processes, *Environmental data collection, Sediment tracers, Wave diffraction, Hurricane protection, Beach nourishment.

This Bulletin consists of 3 articles and a summary of CERC research for FY's 1967-69. The lead article describes hurricane protection in New England harbors. Operation of the gates is described; and based on records of storms since 1935, prevention of losses is projected. A Method for Driving Pipe in Beach Rock describes placing pipe economically to obtain beach profiles without surveying. Wave Diffraction in a Laboratory Movable-Bed Setup discusses how diffraction causes deleterious results. Summary of Research: Wind-Wave Action in Coastal Waters - Studies in coastal areas and wave tanks reported. Shore Processes - CERC studies cover alongshore transport, suspended material, sand simulants, beach profiles and dune building. Long-Period Waves and Surges - Analyzes harbor surging, tsunamis, 2-dimensional long waves. Shore Protection in Bays, Lakes and Reservoirs - Study in Chesapeake Bay by CERC. Biological-Ecological Studies - Program to use offshore sources of sand to nourish beaches; create bottom conditions favorable to marine life; research the effects of waste dumped in the N.Y. Harbor. Environmental Data Collection - CERC studies on sand inventory, sand tracers, wave analysis, wave sensors and surf observation. A laser wave gage was tested at Atlantic City, N.J. Publications - A list of publications for FY's 67-68-69. Miscellaneous Tests - Riprap in reservoirs of the Missouri River Division; sand-filled nylon bags; synthetic seaweed; special techniques for coastal construction; corrosion of steel piling in sea water; and sand slurry abrasion of coated steel pilings. (CERC)
W71-05662

LONGSHORE CURRENT OBSERVATIONS IN SOUTHERN CALIFORNIA,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
Francis P. Shepard.
Available from NTIS as AD-699 391, $3.00 in paper copy, $0.95 in microfiche. Technical Memorandum No 13, Jan 1950.
Identifiers: *Beaches, Erosion, *Ocean currents, California, Ocean waves, Periodic variations, Ocean bottom topography, Surf, *Longshore currents, Beach erosion.

Ocean currents were measured in the surf zone at frequent intervals throughout a year at stations along the southern California coast from the Mexican border to Newport. Results are given.
W71-05673

GENERAL INDUSTRIAL WATER WELL DESIGN FACTORS,
Layne Texas Co., Houston.
O. F. Jensen.
Typescript, 1961. 29 p.

Descriptors: *Water wells, *Drilling, Rotory drilling, Cementing, Aquifers, Specific capacity, Sampling, Drilling equipment, Drawdown, Groundwater.
Identifiers: *Well hydraulics, *Well development, Pilot holes, Calbe tool drilling, Quantitative hydrology, Pump tests, Well interference.

Industrial water well design may best be defined as a progressive quantitative evaluation using engineering principles of several scientific fields. This procedure must necessarily be coordinated with the methods of testing and construction. The design must be based on the natural geologic, hydrologic and chemical conditions of the groundwater prevailing in the area of a proposed well. The pumping rate, or yield, and quality of water produced are direct functions of these natural conditions. The design of a water well system embraces several phases. The preliminary survey of a proposed well location together with the drilling of a test hole or pilot hole survey provide basic data of the prevailing geologic, hydrologic and chemical quality of the goundwater conditions in a proposed area. These data together with application of water well testing and construction methods provide the basis for determining a well design that will result in the most favorable operational performance. The preliminary survey, test hole or pilot hole survey of a proposed well location, construction methods and well hydraulics are discussed in this paper. (Campbell-NWWA)
W71-05691

WELL DEVELOPMENT, A PART OF WELL COMPLETION,
Williams and Works, Grand Rapids, Mich.
Edward M. Burt.
Typescript, 1970. 15 p.

Descriptors: *Water wells, *Wells, Drilling, Groundwater, Equipment, Rotary drilling, Gravel packing, Casting, Turbine pump, Muriatic acid, Screens, Michigan.
Identifiers: Cable tool drilling, Water well construction, Surge block, Horizontal jet nozzle, Air-lift pump, Vertical turbine pump, Explosives, Chlorination.

The object of this paper is to emphasize that part of water well completion known as well development. Some of the available tools are illustrated and various techniques discussed. It illustrates the fundamental elements of the basic types of wells found in Michigan, wherever water bearing unconsolidated formations rest on water bearing formations. The purpose in well development during the construction of a well, is to accomplish the design goal of maximum, sand-free capacity. In the design phase, the selection of a screen and whether or not artificial gravel packing is necessary, combined with the selection of the method of drilling, are the important considerations. The paper is well documented and well illustrated. (Campbell-NWWA)
W71-05692

COLORADO RIVER FRONT WORK AND LEVEE SYSTEMa-HYDRAULIC MODEL STUDIES FOR DEVELOPMENT OF MIXING AND RATING STRUCTURES--DELIVERY OF WATER TO MEXICO, A FEASIBILITY INVESTIGATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
D. L. King.
Available from NTIS as PB-196 303, $3.00 in paper copy, $0.95 in microfiche. Report REC-OCE-70-8, October 1970. 51 p, 43 fig.

Descriptors: *Salinity, *Design data, Appurtenances, Stream pollution, Hydraulic structures, Backwater, Channels, *Discharge measurement, River currents, *Model tests, Hydraulics, Open channel flow, Sampling, Channel improvement, Laboratory equipment, Velocity meters, Water quality, Water analysis, Water sampling, *Mixing.
Identifiers: Fluorometers.

The discharge rating curve for the Colorado River at the Northern International Boundary with Mexico is variable because of the shifting bed. Lack of mixing in the channel results in a nonuniform distribution of salinity and pollutants, requiring frequent and expensive sampling procedures to obtain reliable data. Hydraulic model studies were performed to determine the feasibility of an improved, permanent rating structure and devices to promote mixing of the water in the river. Structures are suggested for an unimproved and an improved channel configuration.
W71-05722

TURBULENT MIXING IN SUBMERGED TWO-DIMENSIONAL WALL JETS,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
C. S. Chu, and C. J. Remenyik.
Available from the NTIS Service as PB-198 029, $3.00 in paper copy, $0.95 in microfiche. Report EM 71-2, December, 1970. 32 p, 17 fig, 5 ref. OWRR Project B-007-TENN (1).

Descriptors: Turbulent flow, *Wall jet, *Mixing, Hot wire anemometer, *Water pollution sources, *Eddy viscosity, *Eddy diffusion coefficient, *Thermal pollution.

A plane, horizontal, two-dimensional, incompressible, turbulent wall-jet of air was studied experimentally. The air flow emerged from a 35 in. wide, 0.52 2 in. high slot at 110 ft/sec tangentially to a 35 in. by 143 in. horizontal flat plate bounded by sideboards. Mean and turbulent flow characteristics were measured in the similarity and the entrance regions up to a distance of 123.6 nozzle heights from the nozzle exit. Mean velocity directions and components of the Reynolds stress tensor were measured with a single rotatable hot wire. Magnitudes of the mean velocity were obtained with a Pitot tube. The hot wire set was a constant temperature hot wire anemometer equiped with a linearizer. Results indicate that the distributions of the mean velocity directions do not become similar with increasing distance from the nozzle. The self-similar form of the non-dimensional mean velocity profile develops within a distance of about 9 nozzle heights from the nozzle exit. It appears that the various turbulence intensities and the Reynolds shear stress reach similarity states at different distances between 16.3 and 20.1 nozzle heights from the nozzle exit. The concept of eddy viscosity does not promise to be very useful in dealing with wall jets. Values determined with measured Reynolds shear stresses and mean velocity gradients show that the eddy viscosity changes very rapidly and in a complex way in the vicinity of the wall and has even a singularity at or near the locus of mean velocity maxima.
W71-05767

8C. Hydraulic Machinery

HIGH HEAD GATE SEAL STUDIES,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
Edward J. Traut.
Available from NTIS as PB-195 741, $3.00 in paper copy, $0.95 in microfiche. Report No REC-OCE-70-37, August 1970. 18 p, 2 tab, 11 fig.

Descriptors: *Gate seals, *High pressure gates, High pressure, Seals, Stoppers, Test procedures, *Laboratory tests, Physical properties, Hydraulic gates and valves, Friction, Test facilities.
Identifiers: *High head, Fluorocarbons, Friction coefficient (Mech), Test results.

Studies were continued on rubber seals to determine the most suitable seal for use on wheel and roller-mounted gates operating under very high heads. The major problem encountered during the closing cycle under unbalanced pressure conditions is the pinching of the seal bulb between the seal clamp and seal seat. Seven factors affecting this pinching were varied in attempts to find the optimum seal assembly capable of withstanding high pressure heads. Ten double-stem seal variations using combinations of stem thickness, fluorocarbon cladding, and rubber compositions were tested at heads up to 600 ft (182.88 m). Tests were conducted in a special test rig accomodating 12-1/8-in.-long (30.798-cm) seal specimens. Tests consisted of measuring the seal bulb extension and photographing and observing general behavior of the seal under load during simulated opening and closing cycles of the gate.
W71-05459

AUSTRALIAN-AMERICAN INTERBASIN WATER TRANSFER,
Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W71-05477

SOME RESULTS OF MODEL TESTS ON FRANCIS HYDRAULIC TURBINES,
N. T. Klyuikov.
Available from NTIS as PB-193 632T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation, Denver, Colo. Trans. from Energomashinostroyenie No 4. Translation No 708, August 1967. 16 p.
Identifiers: *Turbines, *Turbulence, Vortices, Turbine blades, Cavitation, Hydraulic systems, Model tests, Vibration, USSR, Francis turbines, Turbine runners, Translations.

Investigation of vortical turbulence behind Francis turbine runner models showed the causes for formation of vortical turbulence behind the runner, leading to increased cavitation and vibration of the unit. Five different models of runners having a constant draft tube height with a greater than critical cavitation coefficient were compared by visual observation, velocity measurements, linear measurements of vortical flow diameter parallel to and 100 mm from the lower plane of the band, and ratio of the diameter of vortical disturbance to the diameter of the draft tube entrance. Then the results of flow torsion measurements at the runner exit were compared with the calculated data obtained by computing the effect of the distributor. Conclusions were: (1) Vortical turbulence behind runner is caused by a torsion of flow at the runner outlet. (2) During runner design calculations, flow torsion at the runner exit should be considered, taking into account the unevenness of the flow torsion created by the distributor. (3) For Francis turbines with a specific speed of 200, the flow torsion can be defined satisfactorily and the meridional projection of the blades chosen so that the hub velocity equals zero or is slightly negative. (Translator)
W71-05667

SHORT-CIRCUIT FORCES IN SWITCHGEAR INSTALLATIONS,
G. Schaffer.
Brown Boveri Rev, Vol 57, No 6/7, p 303-309, June-July 1970. 7 p, 10 fig, 11 ref.

Descriptors: *Short circuits, Stress, *Switchgear, Electrical equipment, Oscillations, Magnetic fields, Bus (Electrical), *Bundled conductors, Electric current, Electric fields, *Electric conductors, Electric cables, Plastic deformation, Foreign research, Electrical.
Identifiers: Engineering, Transmission (Electrical), Switzerland.

The physical causes, behavior with respect to time, and form of the forces acting between live conductors are considered, and design measures for dealing with short-circuit forces in switchgear installations are discussed. The forces created by a short circuit are not static, but oscillate at twice the power frequency. Danger exists if the natural frequency of the bus bar is close to double the power frequency because resonance can occur. Mechanically strong (rigid) bars usually transfer much greater forces to post insulators than do mechanically weak bars. Bundled conductors encounter 2 kinds of stresses, those between phase conductors and those between the conductors of the bundle. Bundle forces are large because of the proximity of the conductors. As a result of the large bundle forces, conductors move rapidly toward each other during short circuits, causing a shortening of the span and high stresses on equipment. Suspended connections and jumpers swinging violently under the influence of short circuits are particularly vulnerable in high-voltage equipment. Electrical clearances may be greatly reduced under these conditions. Care must be taken with bundled conductors in outdoor switchgear where short-circuit currents may exceed 70,000 amperes. (USBR)
W71-05724

UNBALANCED TENSIONS IN TRANSMISSION LINES,
Pacific Gas and Electric Co., San Francisco, Calif.
D. B. Campbell.
Proc Amer Soc Civ Eng, J Struct Div, Vol 96, No ST10, p 2189-2207, Oct 1970. 19 p, 13 fig, 1 tab, 8 ref, 2 append.

Descriptors: Electric conductors, Computers, *Transmission lines, Ice loads, *Matrix methods (Structural), *Transmission towers, Structural engineering, *Stiffness, Numerical analysis, Electrical insulators, Suspension insulators, Digital computers, Structures, Accuracy, Errors, *Tension, Torsion, Bending, Analysis, Computer applications.
Identifiers: Iteration method.

A nonlinear analysis of an electric transmission line is presented for conditions involving imbalance in conductor tensions. The analysis is applicable to lines containing structures of arbitrary geometry and stiffness. Structure and insulator displacements are considered. Stiffness properties of structures, conductors, and insulators are derived. Equilibrium equations to be used in the analysis are formed. Two numerical methods of analysis, an iteration method, and a step-by-step linear increment technique are applied to the equilibrium equations. Both methods were programed on a digital computer and were applied to an actual transmission line containing flexible tubular steel structures. The iteration method was superior to the step-by-step method. Analysis of this line also shows that neglecting deflections of flexible structures with suspension insulators introduces substantial error. (USBR)
W71-05726

8D. Soil Mechanics

COMPARISON OF THE RESULTS OF LABORATORY TESTS WITH DATA OBTAINED BY FIELD OBSERVATIONS OF THE

PERFORMANCE OF THE DRAINAGE SYSTEM IN THE SOIL MASSIF ON THE LEFT BANK OF THE BRATSK HYDROELECTRIC PLANT,
O. N. Nosova.
TT-55602. Available from NTIS. Translation of Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhniki, Vol 86, p 68-75, 1968. Transactions of the Vedeneev All-Union Scientific Research Institute of Hydraulic Engineering, Vol 86, p 63-70, Israel Program for Scientific Translations 1970. 8 p, 3 fig, 1 ref.

Descriptors: *Drainage systems, *Anisotropy, *Analog models, Model studies, Drainage wells, Reservoirs, Dams, Subsurface drainage, Hydroelectric plants.
Identifiers: *Bratsk (USSR).

Electrical analog models were used to study and plan a drainage system for anisotropically fissured rock at the Bratsk power station, USSR. The drained area consists of lower Silurian sandstone and siltstone covered by a thin layer of Quaternary sediments of low permeability, with underlying thick layers of trap intrusions of diabase which are practically impervious. The permeability of the sandstone and siltstone increases from the bottom toward the top. Certain layers in the central and upper parts of the aquifer have permeabilities exceeding 100 m/day. Due to the geological structure of the site the seepage conditions are most unfavorable. Tests carried out on a three-dimensional electrical-analogy installation at the Seepage Studies Laboratory showed that construction of a grout curtain is not advisable, and that favorable seepage conditions in the central part of the zone considered can be ensured solely by a drainage system. The drainage system consists of a single drainage gallery and a number of drainage tunnels. Both the gallery and the tunnel were to be equipped with vertical drainage wells spaced 10 m from one another. Drainage systems consisting of vertical wells were found to be of little value for lowering the saturation surface in anisotropic fissured rock, since leaks may occur over considerable lengths. (Knapp-USGS)
W71-05456

ON THE PROBLEM OF DERIVING A SYSTEM OF EQUATIONS DESCRIBING THE MOTION OF WATER-SATURATED COHESIONLESS SOIL CONSIDERED AS A MULTIPHASE MEDIUM,
L. A. Eisler.
TT-55062. Available from NTIS. Translation of Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhniki, Vol 86, p 236-245, 1968. Transactions of the Vedeneev All-Union Scientific Research Institute of Hydraulic Engineering, Vol 86, p 231-239, Israel Program for Scientific Translations, 1970. 9 p, 9 ref.

Descriptors: *Sediment transport, *Soil mechanics, *Mass wasting, Compressive strength, Shear strength, Soil physical properties, Flow, Mudflows, Fluid friction, Porous media.
Identifiers: Water-saturated soil.

Soil may be considered as a multiphase medium in which one phase forms the skeleton. The three-dimensional equations of motion for a multiphase medium are written and solved. When the soil contains little air, and surface forces at the interfaces as well as heat exchange between the phases is neglected, it may be assumed that all phases except the skeleton are at the same pressure. The volume strain induced by the effective pressure in the skeleton has to be added to the volume strain of the solid particles, caused by the water pressure. The ratio of these strains must be found by considering the mechanics of the deformation of the soil skeleton and of the particles of which it is composed. When the air content is insignificant the model of the three-phase soil may be simplified and reduced to the model of a two-phase soil. (Knapp-USGS)
W71-05458

MECHANICS OF SLIDE DAMS,
Agbabian-Jacobsen Associates, Los Angeles, Calif.
G. A. Young.
Pap, Symp Eng Nucl Explos, Las Vegas, Nev, p 1198-1221, Jan 1970. 24 p, 21 fig, 20 ref.

Descriptors: *Earth dams, *Rockfill dams, *Nuclear explosions, *Dam construction, Dam design, *Landslides, Dams, Soil mechanics, Mechanics, Model studies, Model tests, Rockslides, Slopes, Construction, Design criteria, Laboratory tests, Bibliographies, Scale effect, Construction methods, *Explosive construction.
Identifiers: *Slide dams.

Problems associated with the construction of slide dams by nuclear explosives are considered. Characteristics of conventional earth and rockfill dams based upon proven techniques developed after many years of experience are examined, and characteristics of natural landslide dams are considered to identify potential problems that must be over-come by slide dam construction techniques. Mechanics of slide dams as determined from small-scale laboratory studies are presented. Many important features of conventional dams must be incorporated into the design of slide dams. For example, foundation treatment and adequate diversion and spillway capacity must be provided, and adequate provisions must be made to control seepage and prevent piping. Important lessons can be learned from observing the characteristics of natural landslides; however, slide dams created by man must provide better results than have been observed in nature. Limited laboratory studies helped define the general phenomena of the mechanics of slides and indicated that the phenomena can be scaled. Conclusions are that slide dams can be constructed and that small-scale field tests and additional laboratory studies are justified. Has 20 references. (USBR)
W71-05729

METHODS OF ESTIMATING LATERAL LOADS AND DEFORMATIONS,
Alberta Univ., Edmonton.
N. R. Morgenstern, and Z. Eisenstein.
Lateral Stresses Ground Design Earth-Retaining Struct, 1970, Spec Conf, p 51-102, Cornell Univ, Ithaca, NY, June 1970. 52 p, 19 fig, 1 tab, 65 ref, append.

Descriptors: *Lateral forces, *Earth pressure, Loads (Forces), Stress, *Soil mechanics, *Deformation, Retaining walls, Soil pressure, Effective stress, Elastic theory, Safety factors, Cuts, *Analytical techniques, At rest pressure, Strain, Theory, Methodology, Boundary conditions, Foreign design practices, Bibliographies, Finite element method.
Identifiers: Empirical methods, Canada.

Methods for estimating lateral earth pressures and deformations are classified into 3 groups: (1) problems of small deformations where lateral pressures and deformations may be computed using elastic theory; (2) problems of small to moderate deformations where lateral pressures are computed using limit equilibrium methods and deformations are controlled by choice of a suitable factor of safety; and (3) problems of moderate to large deformations where lateral pressures and deformations are estimated by semiempirical methods. Application of each method within the 3 groups is subject to limitations. An important limitation occurs because of lack of knowledge of boundary conditions such as those that describe the way walls move, the way excavations are braced, and the stress displacement conditions away from the zone of concern. Successful application of any method can be expected only if soil and pore pressure data are representative. Questions of time dependence of strength or anisotropy may be very important in estimating lateral pressure, and changes in pore pressure and subsequent consolidation may control deformation; in most cases where these unknowns prevail, use of the more advanced theories is superfluous. Has 65 references. (USBR)
W71-05730

DESIGN, CONSTRUCTION, AND PEF FORMANCE OF CELLULAR COFFERDAMS,
Woodward-Clyde and Associates, Inc., New Yorl and Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 08A.
W71-05731

CONSTANT LOADING RATE CONSOLIDA TION TEST,
Hiroshima Univ. (Japan)
H. Aboshi, H. Yoshikuni, and S. Maruyama.
Soils Found, Vol 10, No 1, p 43-56, Mar 1970. 1 p, 13 fig, 1 tab, 1 photo, 8 ref.

Descriptors: Consolidation, *Soil consolidatio tests, Soil mechanics, Soil engineering, *Soil tests Laboratory tests, Test procedures, Clays, *Loadin rate, Preconsolidation, Methodology, Theory Foreign research, Pore pressure, Settlemen (Structural), Preconsolidated soils, Effective stress Comparative studies.
Identifiers: Compression index, Consolidometers Time saving, Japan.

Frequent measurements for about 10 days ar usually required to determine consolidation characteristics of clayey soils by the standard con solidation test. For this reason, the standard test i considered one of the most time consuming an troublesome among routine laboratory soil tests. A consolidation test method using constant rates o loading is proposed as an alternative to the stan dard test. Consolidation tests using the propose method are completed in 2 to 3 hr, and settlemen and base pore pressure can be measured an recorded automatically. Results from the propose test agree well with those from the standard test Test procedures, theoretical background, and ex perimental data are presented. (USBR)
W71-05732

8E. Rock Mechanics and Geology

IMPOUNDING OF MANICOUAGAN 5 RESER VOIRS AS POSSIBLE TRIGGER CAUSE OF LOCAL EARTHQUAKES,
SNC, Inc., Montreal (Quebec).
R. Kall, and S. Charalambakis.
10th Int Congr Large Dams, Montreal, Can, Vol 3, Quest No 38, p 795-814, June 1970. 20 p, 5 fig, 52 ref.

Descriptors: *Reservoirs, *Seismic studies, *Sub sidence, *Earthquakes, Faults (Geology), Subsur face investigations, Stress, Instrumentation, Settle ment (Structural), Dams, Geology, Breccia, Foreign research, Water pressure, Bibliographies, Safety, Seismology, Investigations, History, Seismic stability.
Identifiers: Canada, Seismic sources, *Manicouagan 5 (Canada), Tectonics.

In view of several recorded case histories, loading of the Manicouagan 5 Reservoir could trigger local earthquakes. Impounding of the reservoir is in progress and studies have been made of the impounding at Hoover Dam reservoir in the U.S., the filling of Kremasta and Marathon Lakes in Greece, the pressure-filling of a deep well near Denver, Colo. (in the U.S.), and other cases where loading of a relatively small area of the earth's crust has triggered local earthquakes. Loading and subsidence of reservoir areas are not sufficient for causing earthquakes; tensions must be present in the crust so that unstable conditions prevail under the reservoir area. Only then can an extra load become a trigger to release earthquakes. The Manicouagan 5 Reservoir area is very unique and possibly an unstable structure. The origin of the well-defined, circular feature dates back to a meteor impact in the Triassic period. The explosion created a circular graben structure, the major faults being occupied by Lakes Manicouagan and Mushalagan. Rocks of the reservoir area are different from those of the surrounding Shield, being crushed, brecciated, fragmented, and fractured to a

great depth. The reservoir area is isostatically unstable and presumably in a process of uplift. (USBR)
W71-05735

8F. Concrete

LOW-HYGROSCOPIC PLASTICIZED PLUGGING CEMENT,
Bureau of Reclamation, Denver, Colo.
G. N. Khangil'din.
Available from NTIS as PB-193 590T, $3.00 in paper copy, $0.95 in microfiche. Translated from: Tsement, No 4, p 5-7, 1965. Bureau of Reclamation Translation No 663, May 1966. 11 p, 3 fig, 3 tab, 3 ref.
Identifiers: *Well completion, *Ethanolamines, Portland cement, Translations.

Soviet researchers have developed a new high-quality plugging cement for use in oil prospecting developmental work in Siberia. The good storage properties and wettability of this cement were obtained by adding monoethanolamine during milling. Because a better storing cement was needed for cold humid conditions, a research team from several institutes cooperated to determine what additives yielded the best plugging cement in terms of wettability, strength, viscosity, and other properties. Amino alcohols, mono-, di-, and triothanolamine, were tested using both high- and low-aluminate cements with and without sodium chloride. The paper discusses the properties needed in the new cement, developmental test methods, and results leading to the choice of monoethanolamine as the most effective additive for cold or hot drill holes at the recommended rate of 0.5 to 1%, by weight of cement. Slag-portland cement (40% slag) with admixtures of 1% NaCl and 0.5% monoethanolamine during milling kept a higher strength and flowability in spite of the NaCl content (added to raise the hygroscopic properties). Monoethanolamine lowers water permeability of cement mortar, does not corrode iron, intensifies the milling process to produce finer grinds, increases water-cement ratio, and lowers the specific weight of the grout (important when grouting deep drill holes).
W71-05463

MECHANICAL BEHAVIOR OF CONCRETE EXAMINED BY ULTRASONIC MEASUREMENTS,
Illinois Univ., Chicago.
S. P. Shah, and S. Chandra.
J Mater, Vol 5, No 3, p 550-563, Sept 1970. 14 p, 10 fig, 1 tab, 8 ref.

Descriptors: *Concrete tests, Concretes, Attenuation, *Cracking, Fractures, Nondestructive tests, Fatigue (Materials), *Ultrasonics, Microstructure, Mechanical properties, Failure (Mechanics), Strain, Sensitivity, Cracks, Measurement, Concrete technology, Sound waves, Concrete properties, *Sonic velocity tests, *Ultrasonic tests.
Identifiers: *Crack propagation, Microcracks, Sonic-pulse test.

Ultrasonic measurements were used successfully as external indicators of changes in internal microstructures of concrete subjected to monotonically increasing, cyclic, and sustained loading. The velocity and attenuation of ultrasonic pulses transmitted across concrete and paste speciments subjected to various types of loading were measured and compared to surface strains and internal microcracking. Conclusions are: (1) sonic pulse velocity decreases with increasing length of cracks; (2) increasing the resonant frequency of the piezoelectric crystals used to produce the sonic pulses increases the pulse velocity and the sensitivity of the ultrasonic measurements to crack growth; (3) failure of concrete involves much more gradual and extensive crack growth than failure of paste; (4) cyclic and sustained loading of concrete results in a relatively slow rate of crack growth when failure does not occur, and as failure approaches, the rate of crack growth increases and ultrasonic measurements change very rapidly; and (5) ultrasonic measurements are helpful in contrasting failure mechanisms of sustained and cyclic loading. (USBR)
W71-05723

USBR VIBRATION TEST SYSTEM,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08A.
W71-05727

INFLUENCE ON THE BEHAVIOUR OF AN ARCH DAM OF THE HYDROSTATIC PRESSURE ON THE GROUT CURTAIN AND OF THE STRESSES IN THE GROUND UPSTREAM,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
For primary bibliographic entry see Field 08A.
W71-05734

CONCRETE-POLYMER MATERIALS--SECOND TOPICAL REPORT,
Brookhaven National Lab., Upton, N.Y.
M. Steinberg.
BNL 50218 (T-560) and Bur Reclam Rep REC-OCE-70-1, Dec 1969. 73 p, 55 fig, 43 tab, 9 ref.

Descriptors: *Concrete technology, Concrete properties, Construction materials, Concrete additives, Concrete tests, Lightweight aggregates, Mechanical properties, *Durability, *Polymers, Radiation, Freeze-thaw durability, Catalysts, Monomers, Strength, Research and development, Impregnation, *Polymer concretes, *Polymerization, Lightweight concretes.
Identifiers: *Concrete-polymer materials.

Extended data on concrete-polymer composites as improved materials for construction are presented. The durability properties, such as freeze-thaw durability and acid and sulfate resistance, and the longer-term mechanical properties were investigated. The investigations were extended to include monomers capable of maintaining strength at elevated temperatures--thermosetting monomers such as the polyesters and epoxies, and, with the use of cross-linking agents, the thermoplastic or lower melting polymers. Measurements of mechanical properties at elevated temperatures (up to 290 deg F) are given. Special concretes (light-weight concrete containing foamed-glass aggregate and fiber-reinforced concrete) were impregnated and tested. Improvements in the structural and durability properties of concrete can be obtained by monomer impregnation and in situ polymerization by either radiation or thermal-catalytic means. (USBR)
W71-05736

8G. Materials

LOST CIRCULATION MATERIALS AND THEIR EVALUATION,
National Lead Co., Los Angeles, Calif. Baroid Div.
Robert J. White.
Spring Meeting, Pacific Coast District, Division of Production, American Petroleum Institute, Los Angeles, California, May 10-11, 1956. Reprint, 10 p.

Descriptors: *Drilling fluids, Muds, *Drilling, Rotary drilling, Oil industry.
Identifiers: *Lost circulation materials, Additives, Brand names, Material use, Material function.

The function of lost circulation materials is briefly discussed. The types of materials available are listed, classified and described. The usual effective range of openings sealable is given for each type material. The type of apparatus which have been used for evaluating lost circulation materials are listed. The effect of variables in the testing method on the results obtained is discussed and typical data on several types of lost circulation material is shown. Collection and interpretation of data from laboratory evaluation tests of lost circulation materials are discussed. (Campbell-NWWA)
W71-05689

CURRENT TECHNIQUES FOR COMBATING DRILL-PIPE CORROSION,
National Lead Co., Houston, Tex. Baroid Div.
H. E. Bush.
Spring Meeting, Southwestern District, Division of Production, American Petroleum Institute, March 16-18, 1966, Hobbs, New Mexico. Reprint, 12 p.

Descriptors: *Corrosion (Pitting), *Drill pipe, *Drilling fluids, Fatigue (Mechanics), Oxidation, Rusting, Anodes, Cathodes, Oil industry.
Identifiers: *Corrosion causes, *Surface corrosion, *Hydrogen embrittlement, Corrosion inhibitors, Aerated drilling fluid.

Corrosion still plays a major role in drill pipe failures. Contaminants such as oxygen, hydrogen sulfide, sodium chloride, and carbon dioxide are commonly found in drilling fluids. Recently recognized sources of contamination are thermodegradation of mud products and inhibited stimulation additives, and these add to the corrosion problem. Physical barriers, such as scale, normally occur inside drill pipe and can result in accelerated corrosion attack. The conditions under which present drilling equipment is used increases the danger of corrosion attack from these contaminants. In recent years, test equipment has been developed and is being used to evaluate corrosion problems and mitigation techniques. Examples of techniques both in the laboratory and the field are given. Case histories of corrosion-inhibitor applications are reported. (Campbell-NWWA)
W71-05690

MASTER LIBRARY OF WATER WELL EQUIPMENT AND MAINTENANCE DATA,
National Water Well Association, Columbus, Ohio.
J. H. Lehr.
Pennsylvania, Micro-Graphix, 1970. 1104 p.

Descriptors: *Drilling equipment, *Water wells, *Mining, *Oil industry, Pumps, Screens, Coring, Drill pipe, Drill monitors.
Identifiers: *Water well equipment library, *Water well maintenance data, Auger rigs, Bits, Cable tool rigs, Down-the-hole hammer, Chlorinators, Turbines.

The National Water Well Association's Master Library contains miniature reproductions of 347 different manufacture's catalogs. Each catalog is preceded by a directory identification frame. The frame lists the manufacturer's NWWA identification number, name, address, telephone number and the name of the individual who is responsible for the sale of that manufacture's products in groundwater systems and development. The Master Library represents the most significant advancement in product information storage and retrieval ever accomplished in the groundwater industry. Through the new science of micropublishing, the NWWA has been able to compile and reproduce actual catalog presentation, of most manufactures to the groundwater industry. Each one has been cross-referenced in a comprehensive index. The contents of this library, in original size, would fill more than six filing cabinet drawers. A 7X handviewer is supplied with the Library. (Campbell-NWWA)
W71-05700

8H. Rapid Excavation

HYDRAULIC TESTING OF HOLE UAe-7h, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 08B.
W71-05371

8I. Fisheries Engineering

PONDFISH FARMING IN NORWAY. SURVEY OF THE SITUATION TODAY, AND AN EVALUATION OF SOME PROFITABLE FACTORS,
Leidolv Berge.
Trans from Norwegian. Available from NTIS as PB-193 923, $3.00 in paper copy, $0.95 in microfiche. Bureau of Commercial Fisheries, Washington, D.C. Office of Foreign Fisheries (Translations). Translation, Nov 1969. 121 p.
Identifiers: *Aquaculture, *Norway, *Economics, *Fresh water fishes, Fisheries, Trout, Fishing grounds, Law (Jurisprudence), Organizations, Ecology, Production, Expenses, Statistical data, Oxygen, Economic factors, Denmark, Europe, Japan, Translations, Pondfish farming.

Pondfish farming in Norway; Pondfish farming in Denmark; Production of rainbow trout in Japan; Pondfish farming in Central Europe; Environmental requirements of rainbow trout and the natural conditions for rainbow trout rearing in Norway; The pondfish industry in Norway today; Risks in the pondfish industry; Production functions; Pricing for pondfish products; Pondfish farming as subsidiary or large scale operation; and Future of pondfish farming.
W71-05669

FUNCTION OF THE CTENOID APPARATUS OF FISH IN THE PRESENCE OF A TURBULENT BOUNDARY LAYER,
V. D. Burdak.
Available from NTIS as JPRS 48838, $3.00 in paper copy, $0.95 in microfiche. Joint Publications Research Service, Washington, D.C. Translation, Sept 1969. 4 p.
Identifiers: *Fishes, *Hydrodynamics, *Turbulent boundary layer, Fishes, Scale, Laminar boundary layer, Reynolds number, Skin friction, Reduction, USSR, Ctenoid fish scales.

The hydrodynamic function of fish scale ctenoids is discussed in relation to different states of the boundary layer within the range of Reynolds numbers from 10,000 to 10,000,000. It was demonstrated that the ctenoid apparatus is capable of performing the function of a laminar in the case of both a laminar and turbulent boundary layer, with different degrees of development of turbulence in all instances, ctenoid functions are directed toward reducing the hemodynamic resistance a fish encounters as it moves.
W71-05672

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH IN NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
Warren Viessman, Jr.
Publication No 1, July 1969. 68 p. OWRR Project A-999-NEB (1).

Descriptors: *Water resources, *Research and development, *Abstracts, *Projects, *Nebraska, Aquatic insects, Evapotranspiration, Fish, Wildlife, Flow, Groundwater, Irrigation, Legal aspects, Soil conservation, Water conservation, Soils, Plant physiology, Rivers, Engineering, Water management (Applied), Water quality, Climatology, Water utilization, Waste treatment.

This report is a collection of 80 abstracts describing research projects proposed, under way, or nearly completed, relating to water resources in Nebraska. Research projects in the following fields are abstracted: aquatic insects, evapotranspiration, fish and wildlife, fluid flow, groundwater, irrigation, law, plant science, river engineering, soil and water conservation, soils, water resources management, water quality, waste treatment, water use of plants, and weather and climate. Names and addresses of the principal investigators are listed as well as sources of funds for each project. (Yensen-Arizona)
W71-05468

WATER RESOURCES RESEARCH IN VIRGINIA - ANNUAL REPORT FOR FISCAL YEAR 1970,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.

Available from N.T.I.S. as PB-197 993, $3.00 in paper copy, $0.95 in microfiche. Virginia Polytechnic Institute and State University Water Resources Research Center Bulletin 40, December 1970. 166 p. OWRR Project A-999-VA (10).

Descriptors: *Water Resources Research Act, *Virginia, Grants, Research and development, Water resources development, Waste water treatment, Water quality, Groundwater, Hydrogeology, Water resources.
Identifiers: *Water resources research (Va).

An examination of the various water resources problems of Virginia reveals that no one dominant problem is common to all sections of the State. Therefore, the Virginia Water Resources Research Center studied the critical elements of a variety of problems hoping that this approach will provide a large return for each research dollar expended and will be of some assistance to the several areas of the State. Southeastern Virginia is experiencing a severe lowering of water tables due to excessive pumping. The establishment of water quality standards for the streams of the State pursuant to the Water Quality Act of 1965 has had a significant impact on all sections of the State. Development in some northern Virginia communities has been slowed because additional waste water hookups have been enjoined until treatment facilities are modified or improved for increasing the removal of phosphorus and nitrogen. Improved operating parameters were developed for increasing phosphorus removal in the conventional activated sludge process. Activated carbon can be regenerated by an electrochemical process which would be economical for use in small and medium size treatment facilities. The existing biological and chemical condition of the North Anna River, the proposed site of a nuclear electric plant were inventoried. Waste nylon can be used to remove phenol from water. The research results show promise for the removal of this objectionable chemical by utilizing another waste product. The impact on recreational activity of large drawdowns at multiple purpose water reservoirs is being studied. (See also W71-05556 thru W71-05558) (Knapp-USGS)
W71-05555

ANNUAL REPORT 1970.
Institute for Water Resources (Army), Alexandria, Va.
For primary bibliographic entry see Field 06B.
W71-05663

9B. Education (In-House)

CIVIL ENGINEER IN FEDERAL GOVERNMENT,
Civil Service Commission, Washington, D.C.
N. J. Oganovic.
Proc Amer Soc Civ Eng, J Prof Activ, Vol 96, No PP1, p 9-14, Sept 1970. 6 p.

Descriptors: Administration, *Management, *Federal government, *Civil engineering, *Professional personnel, Education, Engineering education, Engineering personnel, Learning, Training, Performance, Supervision, Scientific personnel objectives, *Professional development, *Civil service. Identifiers: *Civil Service Commission, *Managerial skills, Engineers status, Career development, Careers.

An important aspect of the job of the 18,000 civil engineers in the Federal service is professionalism. A profession is defined in terms of: mental effort based on an educationally communicable body of knowledge, constant growth of the body of knowledge, dissemination of knowledge to all members, a society with professional requirements for membership, and standards of ethics and performance for all members. The various aspects of personnel management problems that the Federal Government faces in dealing with civil engineers and other professionals are: identifying jobs that require professional competence, setting appropriate qualification requirements, recruiting high-quality engineers and technicians, establishing career patterns that foster development and retention of engineers and technicians, providing training opportunities, identifying high potential for advancement, and providing for appropriate participation of professionals in employee management cooperation programs. The Civil Service Commission seeks the cooperation of civil engineers in achieving a top-notch Federal service.
W71-05737

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH IN NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 09A.
W71-05468

WATER RESOURCES RESEARCH IN VIRGINIA - ANNUAL REPORT FOR FISCAL YEAR 1970,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 09A.
W71-05555

10. SCIENTIFIC AND TECHNICAL INFORMATION

STATE OF THE ART REVIEW ON SLUDGE INCINERATION PRACTICE,
Resource Engineering Associates, Wilton, Conn.
For primary bibliographic entry see Field 05D.
W71-05384

ANIMAL WASTES - A NATIONAL PROBLEM,
Cornell Univ., Ithaca. Dept. of Agriculture; and Cornell Univ., Ithaca. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-05420

WATER RESOURCES PUBLICATIONS RELATED TO THE STATE OF NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
Warren Viessman, Jr.
Publication No 2, October 1969. 47 p. OWRR Project A-999-NEB (2).

Descriptors: *Bibliographies, *Nebraska, *Publications, *Water resources, Seepage, Reservoirs, Rainfall, Water utilization, Electric power, Water resources development, Water pollution, Testing, Conservation, Irrigation, Surface waters, Underflow, Watersheds (Basins), Flood control, Planning, Administration, Evapotranspiration, Erosion, Legal aspects, Water distribution (Applied), Drainage, Water wells, Geology, Groundwater, Maps, Water supply, Fisheries, Recreation, Logging (Recording), Water quality, Research and development.

is report is a bibliography of water resources ublications dealing with the state of Nebraska. early five hundred titles are listed by subject, overing aspects of water research, administration, ology, management, planning, conservation, sur- ce and groundwater, and water use. Many ologic, groundwater, and irrigation maps are also ted. Dates of publication range from 1940 to 968. (Yensen-Arizona)
71-05467

WATER RESOURCES RESEARCH IN NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 09A.
W71-05468

BIBLIOGRAPHY ON COTTON IRRIGATION,
For primary bibliographic entry see Field 03F.
W71-05712

INFORMATION FOR DECISIONS IN ENVIRONMENTAL POLICY,
Library of Congress, Washington, D. C. Environmental Policy Div.
For primary bibliographic entry see Field 07B.
W71-05771

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C. Others		
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Office of Water Resources Research	W71-05821	
National Water Commission	W71-05339	

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
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